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EDITORIAL NOTES—GAS, &c.

Local Publicity Work.

SINCE the publication of the special article and the editorial last week on the appeal for funds for the Gas Publicity Committee, from various quarters we have heard the view that the publicity work that is being done locally is sufficient for all purposes. We must dissent entirely from this view. The question of a publicity campaign to-day is not one that has geographical limits. The argument would have applied at one time; it will not do so now. Advertising in the local papers, the circulars, and the mural posters which may be read by but comparatively few, do not meet the cunningly written electrical articles, paragraphs, letters, and page advertisements that appear in morning, evening, weekly, and monthly papers and magazines, with general circulation throughout the country. We are more than ever to-day a travelling people. We have our homes and our places of business; but we are here one day and there another. And in our journeyings literature of all sorts is picked up from the bookstalls, in hotels, in the clubs, reading-rooms, and so on. The London and general papers and magazines have large circulation and sale throughout the country. Those are the channels in which the Electricity Publicity Committee do a great amount of their advertising; and they know that those are channels through which to reach householders, housewives, and business men, whose interest and patronage they want to capture. They are wise in their generation in this respect, if not always just in method. But the channels adopted by them must be made use of by the gas industry. We do not want the Electricity Publicity Committee to have superior means of communication with the householder, housewife, and business man than the gas industry has. Those who think their local publicity methods are sufficient, we are sure, think wrongly. They are allowing seed to be scattered where they have no one at work; and some of that seed will—let this be fully appreciated—take root.

Notable Results of Reformation.

ONE of the difficulties that is met with when considering the phenomenal change that has come over the affairs of the Gaslight and Coke Company during the past five years or so is that—owing to its size, and to the fact that the change is the product of improvement and economies and of the compound advantage arising from the effects of the improvement and economies—one cannot properly concentrate all that the change represents. Reading the report of the proceedings at the meeting last Friday, one does not fail to find interest in every part; and especially in the two speeches made by the Governor (Mr. Corbet Woodall). But if several of the interesting points are omitted, and reading is pursued for the purpose of obtaining a fair idea of the results of the change, this will be found to be an instructive and therefore a profitable exercise. Before proceeding along this line of thought, let it be said that there is no question about it, the spirit of the new policy and of progressiveness is among the proprietors now. It has taken time to plant it there; but one has only to be among them at the meetings, though not much is said from their side of the table, to realize the truth of this. Their appreciation is felt rather than seen. And when the Governor is named by one of their number as the prime mover in the vast scheme of reformation, there is no divided feeling on the matter in the large assembly. When the Governor, in turn, speaks of the futility of any one man's efforts in such a work as this without the unstinted co-operation of a strong and earnest Board, and of such lieutenants as the General Manager (Mr. D. Milne Watson), the Chief Engineer (Mr. T. Goulden), and the Secretary (Mr. H. Rayner), the proprietors share the view, and render the praise; but it does not remove in any whit their knowledge that they have rightly fixed upon the mainspring of it all. It is a strong support behind the Board and the officials to-day.

If we take together the two speeches the Governor made on this occasion, and try to concentrate the fruits of the movement that has been proceeding with unremitting sureness the last five years or so, we see in the first place the extraordinary result of what has been done to get the utmost out of plant, material, and employee co-partners. And it may be observed without hesitation that the last-named know well the difference between progressive effort with common interest and the autocratic rule that takes the heart out of staff and men, and leaves things to pursue their daily round in a definite deep-cut course. They have experienced both. Manufacturing works have been largely reconstructed, more spirit has been thrown into the work, and raw material and manufacturing labour costs per unit of output have descended at a remarkable rate. This has all had a big influence on the financial results, in which consumers, proprietors, and employees have and are sharing liberally; and there is more in store. But there are other aspects of this matter that were brought into prominence at the meeting. When both manufacturing plant and material are jointly yielding their increase, and when plant is put to better use the whole day through than formerly, owing to the co-operative efforts of the Sales of Gas Department, the capital per unit of output must be considerably affected. And so much so has this been the case that whereas the capital five years ago was equal to £661 per million cubic feet of gas sold, and the amount required for dividend and interest was 12·33d. per 1000 cubic feet, these figures are to-day respectively £598 and 11·31d. This is an extraordinarily good showing as the effect of the work of a single quinquennium. Someone may feel disposed to whisper of redemption fund, of sums set apart for depreciation, of considerable amounts spent on wear and tear, and so forth. All this money has had to be provided from somewhere. In the same period, too, the consumers have enjoyed a reduction of 4d. per 1000 cubic feet (and another reduction is foreshadowed), the dividend has been increased, and co-partnership introduced.

But there is a further instructive illustration of the economical benefit that has accrued from works reorganization and improved working in the manufacturing department. The amount of producing plant required for the Company's output and for the taking up of the increase of demand has been considerably reduced; and the consequence is that there is much spare plant, and, in effect, this represents idle capital. In utilizing this, and to a greater extent the resources of the Company, there is further economy within reach; and it is for this purpose, as well as to secure space for business expansion, that the policy of amalgamation was inaugurated—starting with West Ham, and now following on with the Barking and the Chigwell, Loughton, and Woodford Gas Companies, to which latter scheme the proprietors gave their authorization on Friday. When speaking of the West Ham amalgamation two years ago, the Governor referred to the unemployed manufacturing plant; and it is significant of what has been going on, and the effect of it, when the Governor is able to say to-day: "Although "the demand for gas which we have to satisfy is now about "1280 million cubic feet per annum in excess of what "it was at that time, we have to-day a margin as large "as then. All our reconstruction work has added to the "capacity of the plant dealt with, and the quantity of "gas made per ton is also greater." And Beckton will in due course be producing, after parliamentary sanction to the amalgamation scheme is obtained, the gas required for the areas of the Barking and Chigwell Companies, and the difference will hardly be noticed. This, we repeat, is a remarkable illustration of the economies of the times, and of how economy produces scope and opportunity for still further economy.

Some interesting computations could be made as to what would have been the position to-day if working results and costs had remained as they were five years ago. But the only purpose served would be to intensify, by exposing past wastefulness, the excellencies of the present. There are,

however, other figures that can be extracted from the speech of the Governor which present the gain in the Company's financial strength during the five years. The total reserves of the Company, including the undivided balance, now amount to £950,000, compared with £433,000 five years ago; and these accumulations have been made despite the reductions in price, the increase in dividends, and the new payments under the co-partnership scheme. Fourpence is the amount of the reduction to the consumers in the period. Threepence of this represented approximately £80,000 per penny per annum; and the fourth penny roundly £100,000. Everything points to a further reduction of a penny, making the price 2s. 6d.; in fact, the Governor has half promised it. The penny will mean a further £100,000 to the consumers. The reduction, however, made at the beginning of this year (bringing the price to 2s. 7d.) will not, so far as the position can at the moment be gauged, in any way affect the undivided balance at the end of the present half year. The same penny reduction will only, through the requirements of the redemption fund from divisible profits, increase the dividend to £4 14s. 8d. per cent. When, however, the price drops the next penny (to 2s. 6d.), the dividend will be £4 17s. 4d. per cent. With such a solid financial backing, and with the prospects as to dividend and business, the market values of the Company's stocks, which values are something different from the past, should still further ascend.

But a few words as to the factors affecting prospects immediate and somewhat more remote. The Company have made contracts for a large part of their raw materials for the year ending June, 1912, at reduced prices; the residuals markets stand well. There is the lower capital expenditure per million cubic feet of gas sold, and the smaller requirement per unit for dividend and interest. Gas is selling at a lower price; and it will be still lower before long. A short time hence there will be an extended area within which to operate. There is no doubt, too, that Beckton and the neighbourhood are going to benefit greatly by the large dock scheme there in connection with the Port of London. The district around must considerably develop; and the Company will join in the advantage. They are in every way stronger than before financially; and their credit is in high favour. The future is contemplated with great confidence and the deepest interest.

Some Tendencies of the Times.

Almost the last words that Mr. Charles Carpenter used before the motion for the adoption of the report and accounts was passed at the meeting of the proprietors of the South Metropolitan Gas Company last Wednesday, were "we must "move with the times, and we must give more to the slot-"consumer." Without reference specially to the slot consumers, the emphatic spirit in which were uttered the words "we must move with the times" accentuated the compulsory and resistless tendencies of the time, which tendencies leave their marks, good and bad, variously upon the fortunes of humanity both in individual and in collective capacity. Those tendencies are deeply graven upon the address of the Chairman. Taking the address in the whole, the student of sociology would find much in it that would arrest his notice. It tells of the great direct and indirect effects—effects that extend, and do not diminish—that labour brings to bear upon the production of our industries, and upon the cost of the produce to the communities at large. Its influences upon our economic conditions—domestic and political—are indeed far-reaching.

Take almost the first point raised in the speech, in explaining the cause that had brought upon the Company and the gas consumers an additional cost of £22,690 for the quantity of coal carbonized last half year. Despite the facts that our export trade in the course of the year increased by 52 millions sterling, and that unemployment in the country at no time during the winter months has been so severe as in certain immediately preceding years, Mr. Carpenter avers that the increased cost of coal during the year cannot be assigned to the operation of the law of supply and demand. There need not be any hair-splitting over the question as to whether part of the increase in cost was due to a general extra demand for coal, or can be all attributed to the operation of the Coal Mines (Eight Hours) Act. But certainly it cannot be said that the foreign coal trade gave any support to the higher price in vogue last year—the reduction in shipments having been 1¾ million tons, but those (we are not disposed to complain of this) who took the much lessened quantity of coal from this country had to pay nearly £700,000 more for it. This partially gives colour to the Chairman's views. But the bulk of the exports represented by the additional 52 millions sterling required manufacturing, and this demanded coal. Nevertheless, there can be no question about it, the Coal Mines (Eight Hours) Act, on which Mr. Carpenter hangs the whole blame for the increased cost of coal to the Company and the gas consumers, has lifted permanently the level of coal prices above what they would have been had that piece of monstrous legislation not been conceived, created, and put into operation (leaving a trail of disaffection and violence in its as yet short course) solely to serve the ideals of the few, however oblivious or negligent of the effects on the many. But there we are. Nothing but legislation can undo what legislation has performed, and so for the present we may as well suffer the result as contentedly as possible, though it is not an inadvisable thing to occasionally be reminded of the cause of certain manifestly bad effects. The Act has brought about what is called by the Chairman the federation of coal workers throughout the country; and this has (as might have been expected) driven the owners into closer unity to enhance their power of insistence and resistance. But between the two the consumer is in a sort of cleft-stick. This the South Metropolitan Company have realized at a cost of £22,690 in the past half year; and there will be, we take it, a proportionate effect in the current half year.

But the tendencies of the times in respect of the industrial or labouring section of the social structure can in some measure be directed and turned, if dealt with in proper spirit and fashion. This is seen in another part of Mr. Carpenter's address, where he speaks of the enduring position that co-partnership has obtained in the gas industry, and in serving the industry's best interests. Panegyric over the great work of Sir George Livesey is appropriate at any time. It was most fitting on this occasion when the Company in whose midst the system, as planned for the gas industry, was planted are celebrating the attainment of its majority. The system has done all for the workers that its founder predicted. The moral effect upon men and men's lives is remarkable; and that effect induces a lively concern in the affairs of their employment that is very interesting and more pleasing to behold. There must to-day be upwards of 20,000 men in the gas industry under the banner of co-partnership. The gas industry looks calmly on the troublous times in the various industries through the agitation and irritation of labour; it watches as an industry (apart from its share in the body politic and in the material work of the nation) without the feeling of immediate concern the union of trade organizations and socialism, and the growth from the factious teachings of the day of disloyalty on the part of workers even to the laws and constitutions and agreements of their own making. But the gas industry feels a large amount of confidence that such things could not be in their midst; and an important factor in giving the confidence is the partnership in the industry of upwards of 20,000 of the workers. The industry that stands by their workers in this way, the industry that rewards fidelity and interest after the manner of co-partnership, can look without anxiety upon affairs (participation in the effects is another thing) that in other businesses may be matters of constant torment. Try to pierce beyond the present in the light of the position of to-day; and, on the one hand, there can be seen a more powerful and more turbulent labour than ever, and on the other hand, a goodly section of labour pursuing the real ends of life in pacific and enriching ways, through (may we venture to say?) those principles on which co-partnership stands rock-firm.

The speech therefore sets off by illustrating how one movement of the times has affected industry and the body politic; it also, as seen, points to a proved counteracting force; and in the concluding sentences of a reply to a short discussion, the Chairman indicates how the artisan and working classes have come to broaden the base of the gas industry's business. In the case of this Company, no less than one-third of the total output of the gas is purchased through slot meters; and the slot-meter consumer is therefore an important factor in the situation. The tendencies of the times are as educative in the case of working men and others not blessed richly with this world's goods as in other sections of the community; and among the poorest there is a liking to obtain light, and the heat for cooking and getting hot water, in the least possible laborious manner. Through

the slot meter this has been provided; and through it there is offered to the gas supplier at any rate a partial compensation for the uneconomical conditions that a mistaken policy of dissension brings to bear upon the first stage—the purchase of the raw materials—of the business of gas supply. Under all the circumstances, the slot-meter consumers have in these times to be accorded their true position in importance; and Mr. Carpenter mentions how among them the Company are now gradually introducing the refinements and economies of the day in the matter of lighting by means of inverted burners. The times really compel all reasonable protective acts. The big proportion of the slot meter consumers who use cookers and boiling-rings where coal fires in the crudest style were lighted before, and the large proportion of the total gas output that is now utilized for heating—in the last ten years the Chairman tells us, the number of gas cookers and fires on hire have more than doubled in South London—provides illustration of yet another tendency of the times, which has done much to produce more sanitary atmospheric conditions. But while this is going on, the local authorities themselves provide a set-off by putting down large electric power stations, from the chimney shafts of which the air is considerably fouled; while there is a smokeless fuel lying almost at their doors in the shape of gas-works coke. Mr. Carpenter deals with the objections to its use under boilers of the marine type; and he certainly makes out a case for a further trial of the fuel. He also points to the popularity in the Company's district of the system of retailing coke in paper bags; and the figures given in the report of his remarks will, we think, prove of general interest.

We dealt with some of the financial and working features of the Company's operations in noticing the Directors' report and accounts a fortnight since, and will not enter further into them on this occasion. But they and the proceedings at the meeting of the proprietors show that, though local circumstances for a time were not of the best, and despite the highly competitive character of gas commerce to-day, the business grows year by year, and it stands to-day firmer than ever. This has general application to the gas industry, which has shown a remarkable adaptability to the modern tendencies.

Gas as Fuel.

The paper that Mr. H. James Yates read last Wednesday before the Liverpool Engineering Society, on "Gas as a "Fuel" contains several matters on which gas engineers are already well informed; it incorporates points that are matters of controversy; and it indicates as tersely as possible where we are in this great and varied business of the application of gas to heating purposes. The more we consider the potential side of the gaseous fuel question, the more illimitable appears the field; and encouragement to look upon the industry of gas supply as something holding possibilities larger than we have ever regarded them before grows with consideration. The incandescent burner has placed in our hands the opportunity for contemplating a vast side to the gas business that no sane man would ever have ventured to entertain had the main use of the staple commodity been for its independent luminosity. The advance made in the heating business has already been satisfactory; but the revolution in the character of the business, and in the needs in regard to the gas supply, is of a nature that cannot be dealt with in a day on the foundation provided for distinctly different conditions. The process of transformation has been to proceed by orderly and deliberate steps. Mr. Yates's paper shows the industry to be on the right high road in regard to its heating appliances, and in the developments that have been made; and all he says indicates that the gas-supply industry is—perhaps in places slowly—realizing what lies before it. It is well that these facts should be advertised as widely and broadly as possible before organizations, such as that of the Liverpool Engineering Society, whose members, whether or not they be gas engineers, have the technical knowledge to enable them to grasp the position. In such cases the information does not enter one ear and out of the other; and we can never know the useful end of facts so placed. Therefore, the President of the Society (Mr. Edward Allen) did the right and opportune thing in getting a gentleman to review the gas-heating situation who occupies a position from which that situation can be so completely and continuously surveyed, and who capably performed his task without a hint of any desire to further the commercial interests of any one particular firm.

But of the two large branches of gas utilization, the one in which the greatest mistakes have been made has been this of the application of gas to heating. Mistakes have been made not only by the manufacturers of the appliances, but by the gas suppliers. Those of the latter, however, can be summed up by saying that at one time they took a too narrow view of what was actually before them. Those of the manufacturers can be focussed by saying that a slavish empiricism for a considerable time made the road to improvement long and tedious; but since, with scientific knowledge brought to bear, the pace has been much more rapid. It is not a great while since that gas-stove makers fully appreciated that radiating efficiency was the principal thing to be worked for in an ordinary gas-fire. But where are we to-day? There are gas-fires now that will give a radiating efficiency of 55 per cent.; and of the heat units developed by the combustion of the gas not more than 25 to 30 per cent. escape by the flue. When we can, as we can now, get a 21-inch fire consuming less gas than the old pattern 10-inch one (which, viewed from the present state of knowledge, exhibits itself in its former type as an excellent efficiency defeating structure), the merit will override such obstacles as the loose and ignorant assertions in "The Times" or elsewhere of electrical engineers such as Mr. A. H. Seabrook, who avows that, with a gas-fire fitted with a flue, "electri-"city can compete on cost, because most of the heat units in "the gas are sent up the flue." How any man who knows the real position to-day can associate himself with such a false and absurd statement passes comprehension. Electricians who deliberately refuse to make themselves acquainted with the efficiencies of modern gas appliances with the view of playing upon the ignorance of the public through their own deficiencies, cannot, of course, be expected to keep themselves abreast of the times in relation to gas affairs. It would not harmonize with their policy. But those who are rightly inclined cannot do better than read the paper by Mr. Yates, and the reports that have emanated from the Leeds University, to ascertain exactly the position regarding gas efficiencies, wasted heat units, and poisonous fumes that escape into the apartment in which a gas-fire is used. They will find that science and gas-heating progress have not stood still in the interests of the electrical industry. The phantoms created by electricians and by the officials of a certain Government Department are also laid low in the paper before us. Information is given as to the gas-steam type of radiators; misconceptions regarding flueless radiators are dealt with. The limiting conditions in respect of some methods of water-heating by gas are not avoided; and how gas can be, and is, economically applied to this purpose is described. There is a suggestion as to sulphur other than sulphuretted hydrogen to which the attention of certain gas undertakings is invited. The advantages of high and low pressure gas heating in manufacture are also related.

It is an informative paper; and the large subject is treated upon in the comprehensive manner that forces upon one its importance. The rapid strides of gas heating in the past few years bid us believe that, through this business, the position of the gas industry will have undergone a very remarkable change by the end of the second decade of this century. It is a matter over which, through the opportunity for extensive observation, we at all events are optimistic.

Holborn Public Lighting Injustice.

Sick at heart at seeing the new contracts for public lighting falling one after the other into the hands of the Gaslight and Coke Company, the three Electric Supply Companies whose areas take in parts of the borough of Holborn—one of them the Metropolitan Electric Supply Company, who failed, after strenuous efforts, to carry the Paddington contract just recently—have put their heads together with the view of preventing the Gas Company filing the Holborn contract. They feel that one contract out of the many new ones entered into must, at any cost, be saved to the electrical industry; and so it came about that, on a tender for a total supply of about 405,000-candle power in the borough—not on the fiasco of an experiment in Gower Street—the three Electric Light Companies combined offered to supply at £925 less than the Gas Company; the respective figures being £6602 and £7527. The figures submitted by the Gas Company are, for the greater part of the lamps, on the same basis as the tender that they made as far back as July last, and on the same basis as the contracts that have been entered into with other boroughs, and over which the Electric Lighting Companies have signally failed. The figures of July last

the Electric Companies had before them when making their Holborn offer; and, with the knowledge in their possession, they could not brook the stigma of another loss. So they based their offer on unprecedentedly low figures, which aggregate to £6602; being £86 less than the figure offered by the Gas Company for the scheme submitted in July last. Nevertheless the Works and General Purposes Committee last week recommended the acceptance of the Gas Company's tender, on the grounds that the difference in cost was not sufficient to warrant any radical alteration of the system of lighting, and that the Company's scheme would involve the least amount of interference with roadways and pavements. There are other considerations not specifically mentioned in the report, such as the uncertainty as to the cost of any new electric lamp columns, and the plans of the Electric Companies as to how they intend to distribute the total illuminating power. There are also the points as to the recognized superiority of incandescent gas lighting over electricity in times of fog, and the greater reliability of gas lighting for public purposes. These are worth something to the public. Any impartial person, too, who compares the present Marylebone electric lighting with the Westminster inverted gas lighting could not fail to speak in favour of the latter. It was evident, however, when the recommendation came before the Holborn Borough Council last week, that certain members had been well worked up in the electrical interests; and even the "Daily Chronicle," with raucous vehemence, called upon the Council to do their duty by the ratepayers by accepting the tender for electricity. The result of it all is that the tender has been referred back to the Committee for a month.

The matter is not settled yet; and what will happen we cannot say. But the tender of the Electric Light Companies is, it seems perfectly clear, based upon their knowledge of the prices that were submitted by the Gas Company in July last. That is where the injustice to the Gas Company comes in; and before the month expires, we hope they will make their protest in a very effective manner. Whatever may be the course pursued by them, it must be taken as a protest against the injustice of "competition" with the main figures of one side exposed to the other. The Company have throughout this business occupied an unenviable and an unfair position; and although certain members of the Council talk about the saving that would be effected by the adoption of electricity on the terms at present before them, they ought to make some recognition of what there can be no doubt is the fact, that the electricity offer is not exactly what it would have been had both sides been absolutely in the dark as to what the other was doing.

Throughout this Holborn business, there has, it has appeared to us, been something about the electrical side of it that has been purely fictitious, and not real commerce and fair play. For the Gower Street experiment, the Borough Surveyor specified lamps giving a minimum of 300-candle power. The Gas Company put up lamps that approached as near the minimum as possible. The official tests made accorded them a candle power of 318 candles. The Metropolitan Electric Supply Company erected lamps which the official tests show to be only 5 candles below 400 candles, or about 25 per cent. above the minimum asked for. The electrical papers went into ecstacies over the so-called better illuminating power of the electric lamps. Of course, if the Gas Company had put up lamps of an illuminating power 80 candles higher than the electric lamps, there would have been loud howls of indignation by the electrical people over any judgment being based upon such a comparison. But what does the report tell us? That, notwithstanding the higher candle power at the source of the electric lamps, the illuminating power along the centre of the road, at equal distances, was found to be about equal for both illuminants. Now what is to be said to Mr. Kenelm Edgcumbe's figures that were lately published, which ascribed 475-candle power to gas-lamps which the official tests say are of 318-candle power, and 430 candles to electric lamps that are officially described as of 395-candle power? That is to say, between Mr. Edgcumbe's figures and the results of the official tests there is a difference of 157 candles in the case of the gas-lamps, and only 35 candles in the case of the electric lamps. The great divergence is, to say the least, curious. But after all not much reliance is being placed on a trial which left it open for the electricians to put in lamps 80-candle power higher than their competitors. But the tenders are based upon a total illuminating power of approximately 405,000 candles, ascertained on specified conditions. We know what has happened before in these public lighting tenders; and we know what would have happened in this case had the Electric Companies' tenders followed certain precedents of comparatively recent date. Within a month, the final issue of this business should be before us; and should it be that the Electric Companies are eventually voted the contract, in view of the stated facts and the non-success of electricity in other boroughs where there has been open and fair competition, this will be for them an inglorious victory.

Successful Assessment Appeal at Malton.

In another part of the "JOURNAL" will be found a full summary of the concluding proceedings in a successful appeal by the Malton Gas Company against the rating of their undertaking by the Assessment Committee of the Malton Union; a report of the opening of the case having been given in the issue for the 10th ult. (p. 106). The circumstances under which the appeal was made, as set forth in the remarks of the Chairman of the Company at the recent half-yearly meeting, also given elsewhere, are somewhat peculiar. As far back as 1894, the assessment was settled at £1010 gross estimated rental, and £708 rateable value of the Company's works and mains in Malton and Norton together. The introduction of electric lighting by the District Council in 1904, and the subsequent loss of the public lighting, brought about an altered state of circumstances which led the Company to appeal against the assessment, which they submitted should be brought down to £502. As a result of interviews with the Assessment Committee, the Company accepted an offer made by them of £550; the Chairman (Mr. H. W. Pearson), after consultation with the Engineer and Secretary (Mr. Henry Tobey), deeming the difference of £50 not worth fighting about. A few weeks later, however, notice was received from the Committee that they had increased the gross rental to £1683, and the net rateable value to £846. No explanation was given for this increase; but it came out in the course of the proceedings. The Committee's adviser discovered that the statutable deductions he was bound to allow amounted to more than £800; and if he allowed these on the £1010, it would leave them with only £200, and the Company were only asking for a reduction to £502. Under these circumstances, the Company thought they had better submit their case to an independent tribunal—viz., the Justices at Quarter Sessions; and they were rewarded by a unanimous decision to allow the appeal. The gross estimated rental submitted by them (£1408) has been adopted, and the net rateable value reduced to £525—just £25 less than the amount the Company accepted from the Committee. As the respondents will have to pay the costs, the expenses of the appeal will fall upon the ratepayers in the Union; and the Gas Company, as the largest of them, will have to bear their share. Though the figures in the appeal are not large, there are some points in connection with it of special interest; and in directing attention to the summary of the proceedings which we give, it may be mentioned that it has been prepared in what we venture to think is a better form than that of an ordinary newspaper report, and moreover it contains the bases of the valuations submitted on both sides. We trust it may be found useful to readers when they are engaged upon valuation questions in regard to their works.

An Arbitration Award.

Proceedings in arbitrations held to determine the price to be paid by a local authority for the acquisition of a gas or water company's undertaking always possess an interest beyond the parties who may be immediately concerned in a particular case, inasmuch as, whether the amount involved be large or small, the principles on which valuations are based by contending parties, and the points argued, will probably to a considerable extent be followed when tribunals of this character subsequently sit for a similar purpose. For this reason, it is the aim of the "JOURNAL" to publish such reports of inquiries of this kind as are likely to be helpful to those who may at any time be concerned in either the buying by, or the selling to, a local authority of the property of a gas or a water company. Just lately, space has been devoted to reporting the proceedings in two arbitrations—one with regard to the acquisition of the undertaking of the Kirkcaldy Gas Company, and the other concerning the purchase price to be paid for the Worksop Water-Works. In the former case, however, the hearing has not yet been completed.

The arbitration between the Worksop Urban District Council and the Worksop Water Company occupied five days the early part of last month; and the award of the Umpire (Mr. A. J. Ram, K.C.) has now been issued. The difference between the valuations submitted on behalf of the two parties at Worksop was very great; the figures being some £83,057 for the Company and £48,927 for the Local Authority. In the result, the Umpire has fixed the price to be paid at £64,612, which, it will be seen, gives the Company roughly somewhere about one-half of the amount that was claimed by them beyond that which the Council's witnesses put forward as a fair price. In other words, the way in which the adjustment works out is that the difference has been nearly equally divided. For the Company, the valuation (as that of an amply secured maximum dividend paying concern) was based on the 3 per cent. table, with an amount for back-dividends payable, and a claim for over-spent capital. But in place of the 33½ years' purchase thus urged, the Council contended that the elements of uncertainty in connection with the undertaking were so large that a fair valuation would be 20 years' purchase of maximum dividends, with no allowance for back-dividends, and a somewhat smaller amount for over-spent capital than had been claimed by the other side. Had there been no "elements of uncertainty," 25 years, or a 4 per cent. basis, would have been conceded by the Council. Those who read the evidence when it appeared in the "JOURNAL" for Jan. 24, will remember that there was a peculiar feature in the case, inasmuch as a deficiency in the supply in 1908 was found subsequently—and after the Company had gone to Parliament for authority to provide a further source of supply—to have been occasioned by defects in an existing pump and suction-pipe. When these trifling matters had been rectified, the supply of water was discovered to be ample.

Lighting at the Festival of Empire Exhibition.

The South Suburban Gas Company have to their credit an important success, in obtaining the contract for the lighting of the Festival of Empire Exhibition at the Crystal Palace this year. The matter is referred to in the Directors' report, as noticed to-day in our "Miscellaneous News" columns. The information there given is that the contract includes the lighting of the grounds with high-pressure incandescent gas-lamps and a part of the Crystal Palace itself during the exhibition, and to supply and maintain the gas-engines required by the Exhibition Committee for generating their own electricity for lighting and other purposes. This latter brief announcement seems to conceal a significant tale. It may be expected, as the matter is a distinct feature of the Directors' report, that the Chairman of the Company (Mr. Charles Hunt) will make a point, in his address to the proprietors at their meeting next Friday, of this notable success, and give more information in regard to it. Meanwhile, he and his colleagues, and the Engineer of the Company (Mr. S. Y. Shoubridge) must be heartily congratulated upon it. Not only for the South Suburban Company, but for the gas industry at large, the advertising value of the big display that will be made will be immense. The Festival of Empire Committee is a strong and influential one; and they intend making the Crystal Palace this year, with the exhibition and its pageants, second to none as a centre of attraction in and about London. The London, Brighton, and South Coast Railway Company, too, are making rapid strides in electrifying their lines between London and the Crystal Palace for rapid transit. So that, given fine weather, we can anticipate that considerable numbers of gas men will be finding their way to the Palace this year in order to inspect, in conjunction with the exhibition, the results of the work of the South Suburban Gas Company.

Doing Duty to Posterity.

Municipal trading is apt to disappoint those who look to it as a source of profit and build upon it hopes of reduced rates. It is not, however, always such a burden upon the community as Sir Joseph Bellamy has shown it to be at Devonport. The people of that dockyard borough have been rather priding themselves on their enterprise in municipalizing things, and their independence of the neighbouring borough of Plymouth. So far as we know, the only advantage gained thus far from any of the undertakings which the town has acquired is limited to this pride of possession. There have been no profits out of which to relieve the burdens of the ratepayers, and the cost of the services to the consumers is not less than when they were managed by companies. No doubt there are reasons for this; and probably we may be told that, in regard to both the gas-works and the water-works, the Corporation have thought it necessary to spend large sums on reconstruction. Nevertheless, as regards the gas undertaking, Devonport does seem to be paying a stiff price for its municipal enterprise. According to Sir Joseph Bellamy's calculation, they might have saved the last ten years £15,000 a year if, instead of constructing practically new works for the manufacture of gas, they had been content to purchase gas in bulk from the Plymouth Gas Company. In other words, Devonport, during all these years, might have been having gas at the Plymouth price of 1s. 8d. or 1s. 9d. per 1000 cubic feet, instead of paying 2s. 6d. But Devonport, we are told, would not have accepted such an offer. Alderman Tozer, the Chairman of the Gas Committee, says it would have been refused, because the Corporation have faith that, ultimately, their works will produce gas as cheap as that of Plymouth. He holds out the hope of an immediate reduction of 2d. or 3d. per 1000 feet, and a further reduction in the years to come. This prospect should be welcome to the consumers; and it is to be hoped it will be realized. In the meantime, the ratepayers and the gas consumers have the satisfaction of knowing that they are doing a good deal for posterity. The £15,000 referred to is exactly one-third of last year's revenue from the sale of gas, and is equal to a rate of at least 1s. in the pound in Devonport. Gas consumers who are paying 33 per cent. more than is necessary, or ratepayers who are contributing to the rates this extra 1s. in the pound, may flatter themselves that they are doing their duty to those who will follow them and maintaining a proud independence. It is a splendid thing, no doubt, to imagine that in course of time the undertaking will be free from debt, and that there will then be, as Alderman Tozer says, a magnificent sum to go to the relief of rates. When that good time comes, the probability is that the present generation of ratepayers will no longer be interested in the matter. They will have had the satisfaction of contributing some £150,000 or £200,000 for the benefit of posterity, which will owe at least this debt to their memory.

Sulphate of Ammonia and Sugar-Beet.

Sulphate of ammonia makers are intimately interested in the efforts that are being made in this country to establish sugar-beet cultivation, and sugar factories; but there appear to be great difficulties in the path of giving the industry a fair and proper start. It is looked upon as a very speculative matter; and this is the lingering result of experiments of long since, conducted at a time when knowledge was not so mature here as it is now for effectively showing the practicability of the scheme. The Earl of Denbigh has taken a prominent part in trying to plant the businesses of beet cultivation and sugar manufacture here; and though recent experiments have disproved the contention that the English climate is unfavourable to the cultivation of sugar-beet, he finds that a besetting obstacle is the money with which to launch the new industry in a manner that will aid, and not prove disastrous to, its life. He has time and again besought the Government to extend to it financial assistance; and ministers last session seemed favourable to the proposal to do something from the Development Fund. The subject was again introduced by the Earl of Denbigh in the House of Lords last week, when he suggested that the Government might render the movement aid by guaranteeing mortgage capital for the establishment of sugar factories, or by giving a bonus of so much per acre to farmers who grow beet. He was flatly told, however, that it would be impossible to give a subsidy from the Development Fund, as no grant could be made to any company trading for profit, neither would it be possible to make a grant to farmers growing beet. But opinion in the House of Lords is divided on the subject; and hope is not yet dead that the Government will find some way to lend the desired helping hand. The ground for the hope does not appear to be a very substantial one.

The Cheapest Gas in London.—About this time last year, the Directors of the Wandsworth and Putney Gas Company reduced the price of gas from 1s. 11d. to 1s. 10d. per 1000 cubic feet, and thereby earned for the Company the distinction of supplying the cheapest gas in London and the suburbs. They have just given evidence of their determination to sustain their reputation by announcing a further reduction to 1s. 9d., at which price the users of gas-engines, who are allowed 15 per cent. discount, will pay only a little more than 1s. 5¾d. per 1000 cubic feet.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 469.)

THE cheerfulness which was a prominent characteristic of many markets in the Stock Exchange for the previous week was well maintained in the week just closed. The popular demand for choice investment securities continued in spite of rising prices; and Consols were repeatedly done at the (comparatively speaking) high figure of 80⅛. Most of the gilt-edged class also were buoyant. In other quarters, a happy recovery in the much-depressed Brewery preferences was welcome. Business was rather restricted on the opening day, but the tone was very fair. Government issues were firm, Railways rising, Americans stronger, and the Foreign Market mostly good. On Tuesday, business was very moderate, and the fortnightly settlement received attention; but markets in general remained firm and cheerful. This disposition was confirmed on Wednesday; the choicer securities being quite firm, and Railways much pleased with dividend announcements. On Thursday, there was some quickening up in point of activity; and the general sunshine was unclouded. Friday was quite a good day, and unchecked by realizations; while a satisfactory settlement contributed to make things bright. Saturday's business was well up to the average; and markets generally were good. Consol prices were unchanged; but the account quotation was put down ⅛. In the Money Market, there was an abundant supply at lower rates, and discount terms eased away materially. Surprise was widely expressed that the Bank of England rate was not lowered on Thursday. The Gas Market had another bright week, with strong and advancing prices; but the volume of business done was not equal to that of the previous week. Half-yearly accounts to hand, and announcements at general meetings made, show that the industry everywhere is in a flourishing condition. In Gaslight and Coke issues, the ordinary was quieter. Prices were, however, rather higher—from 107¼ to 108; but the quotation was left without a rise. In the secured issues, the maximum was done at from 87½ to 88½, the preference at 104¼, and the debenture at from 78¼ to 79½. South Metropolitan was rather more active, and changed hands at from 121¼ to 122¼ *cum div.* and from 118¾ to 119⅞ *ex div.* The debenture marked from 79 to 80½. In Commercials, the 4 per cent. realized 115 and 115¼, the 3½ per cent. 109, and the debenture 77¼ and 78. Among the Suburban and Provincial group, Brighton ordinary was done at 162, British at from 44¼ to 45, Hastings and St. Leonards 3½ per cent. at 96, Lea Bridge at 123¼ and 123⅜, Tottenham "B" at 116 *cum div.* and at 114⅞ and 115⅛ *ex div.*, Wandsworth at 144 (a rise of 1), and (on the local Exchange) Liverpool "A" at 221½. Other Suburban and Provincial advances were in Brentford new, Brighton original, and South Shields. In the Continental companies, the incident of the week was the European Company's announcement of a scheme for allotting bonus capital out of reserves. The net result will be to convert the £10 shares now receiving 12 per cent. dividend into £13 6s. 8d. shares with a prospective 10 per cent. dividend; thus increasing the amount of dividend now paid by one-ninth. The Company's shares consequently had a smart rise; the fully-paid marking from 26⅜ to 27, and the part-paid 20½. Imperial was unchanged at from 185 to 186½; and Tuscan was done at 9¼. Among the undertakings of the remoter world, Bombay made 6 11/16, Cape Town 4, ditto preference 6¼, Melbourne 4½ per cent. 103, Primitiva from 7⅝ to 7¾, ditto preference from 7 15/16 to 7⅞, and San Paulo 15¾ and 15⅞.

Personal.

In the course of the report on "The Lighting of Calcutta," which appears elsewhere to-day, there is the following paragraph referring to the management of the Oriental Gas Company's works, in a letter written by Mr. Jacques Abady: "The Directors have appointed Mr. L. M. SNELGROVE as General Manager; and I believe that a gentleman with the experience of Mr. Snelgrove in construction, management, and distribution cannot fail to uphold the obligations of the Directors and the interests of the Corporation and citizens of Calcutta to the fullest extent." A competent Works Foreman and an additional Distributing Engineer are also being appointed, and will shortly take up their duties.

Obituary.

We regret to record the death on the 3rd inst., at his residence, "Almagro," Vanbrugh Park Road West, Blackheath, S.E., of Mr. WILLIAM BUTLER WHITAKER, who was for many years Engineer of the Argentine Gas Company of Buenos Ayres, but left their service on the undertakings of the Company and the Belgrano Gas Company being acquired by the River Plate Gas Company about twelve years ago. Deceased was admitted into the British Association of Gas Managers in 1871, when he was at Belper; and a few years later he left this country for South America. He passed into the Gas Institute, and eventually into the present Institution; his name being on the roll of members at the time of his death. He became an associate member of the Institution of Civil Engineers in 1882; and was transferred to the class of members in 1896. He was in his 71st year. The funeral took place at Charlton Cemetery last Wednesday.

ELECTRICITY SUPPLY MEMORANDA.

Caution from a Fire Office—How Not to Make Money—Water-Heating Difficulties—As Others See Our Appliances—Queer Arguments and Tactics.

IT will require all the energy and wit of the electrical world to remove the suspicion regarding the safety of electricity as a lighting agent that has taken root among drapers. The subject was referred to quite recently in the "Memoranda," and the receipt of a little booklet brings it up again. It will be remembered that, after the big Clapham fire, which it was reported cost the Insurance Offices £130,000 (of which the Phœnix Company had to pay, it was said, £33,000), the Company named set about revising their rules, making them a bit more stringent here, and a bit more stringent there, in the attempt to avoid such catastrophes. If drapers and other people want a fair amount of assurance that their premises are as secure as electrical knowledge can make them against the insidious action of electricity in creating fire, then the installation must be made with an elaborateness and expense that only the wealthy houses can afford. Meantime the electrician continues to shout in the market place of the "safety" of his commodity; and the public smile at the audacity of the modern Don Quixote. Most drapers have no doubt received from the Drapers' Mutual Fire and General Insurance Corporation, Limited, the booklet now before us, giving certain hints respecting electrical installations. The worst of the multiplying of rules, regulations, and hints, from the electrical point of view is that it brings into greater relief the counterfeit character of the coin inscribed "Safety." Not all the rules of the Institution of Electrical Engineers, the Fire Offices, and Government Departments have prevented the many life and property destroying fires that have occurred through electricity. The events satirize the sufficiency of the formulated precautions. These events, or those that have taken place in their own particular world, have produced a distinct restlessness among drapers, as their own news organs have shown.

Most drapers in the country have probably received the booklet mentioned above; and words printed in red on the face remind them of the uncertainty in the midst of which those live whose premises are fitted up for electric lighting. The red ink is suggestive of fire. The words are "A Disastrous Fire may be Prevented by Reading This." The words present caution in all its glory. "May be"—not will be, though the advice be followed. But why should the Drapers' Mutual, &c., &c., be so solicitous about giving "a few practical hints on the management of electric installations." The answer is only to be found in a ghastly record of destruction. The hundred rules and regulations of the Institution of Electrical Engineers bear witness to the inexactitude of the statement that "electric lighting has fewer fire risks than any other" form of artificial lighting. Why, if this be so, trouble to supply rules and regulations? Why need insurance companies issue booklets of admonition concerning electric lighting? The fact is that, from entrance service to lamp, many risks exist—risks which have frequently in some of the best of installations developed into something very real before any warning has been given. Every individual rule, regulation, or hint applying to electrical installations indicates where risk lurks. And the strictest compliance with rule and regulation does not prevent, as time passes, the deterioration of the wiring and the fittings. In this booklet, the chief causes of conflagrations originated electrically are ascribed to frayed or badly insulated flexible wires; to fuses not protected with fire-proof covers, or fitted with unsuitable fuse wire; to arc lamps not properly enclosed, or to controlling apparatus overheating; to draping and other light material coming into contact with arc or incandescent lamps; to leaky cables and loose connections; and to temporary wiring for alteration of the number or position of lamps. Each one of these causes is accompanied by an explanation of the possible results of the defects, with an account of the precautions to be taken. There are many hints for assimilation by drapers employing the electric light; but the assurance is given that they have not been prepared with the view to alarm, but rather to assist and protect. But after reading the booklet, drapers may well pause to inquire as to whether it is not a treacherous means of illumination that demands such elaborate warding.

Enthusiasm over electric cooking and heating ebbs and flows among our electrical friends with periodic alternation. At one time, appliances are right, initial costs are right, working expense on a par with the competing agents; and there is nothing to be done but to take possession of the fair field lying before the electric-supply industry. At another time, truth prevails; and the scene is a blank, and despondency is of the darkest order. We have recently seen the wave of appreciation that has passed over the electrical industry as to the mistaken confidence that has burst out afresh time after time as new electrical cooking appliances or water heaters have made their appearance. But in the midst of this, an intrepid being now and again comes to the front urging a forward movement. A writer in the "Electrical Review," covering his identity under the impenetrable style of "Interested," assures all who want to enrich themselves (he does not say why he is not one of the number) that money awaits the enterprising man who is first to inaugurate a regular business in the hiring-out of first-class electrical cooking goods, on a large scale, on reasonable terms. He also declares that in any town worthy of the name there exists to-day a big demand for good electric cooking ranges, and also for some form of electric water-heater, capable

of giving a continuous supply of hot water throughout the day. This being so, wherefore the marked depression that prevails in the electrical industry over this subject; for all our electrical contemporaries have time after time sung the praises of appliances of various kinds that they have freely described as first class. But as it is said there is money in the business, the article of "Interested" naturally interests. We proceed, and ascertain that once get over the large amount of first cost, and three parts of the difficulty now standing in the way of electricity for domestic purposes is removed. We are soon brought face to face with the fourth part, when we read that "really serviceable goods, economical in their consumption, are few and far between." "Some articles of this nature are all right in themselves, and do what is claimed for them; only in their consumption of current they are a long way from being satisfactory." We should have thought that this formed three parts of the difficulty, and not merely the fourth part. Once produce real economy and reliability in the service rendered by the goods themselves, and the electricity suppliers and manufacturers would no doubt between them devise means of reducing the first cost to the consumer. Then comes the old advocacy of still lower rates for current. But the economy and profit to the electricity undertaking of supplying for cooking and heating at bare fuel cost figures are matters that do not enter into consideration in print. Luton, Bradford, and Southampton are already charging, or are proposing to charge, only 0·5d. per unit, and Accrington 0·75d. And the "Electrical Times" breathes the impious hope that the number will be swelled within the next few months. The results in the adoption of electrical cooking appliances, and the results to the electricity undertaking in enlarging the profits, will be watched for with interest. But to return to "Interested." We are grievously disappointed that he has not presented us with a more tangible money-making scheme. What he has written is all too chimerical.

The "Electrician" has also been returning to the subject in connection with the paper that Mr. Harold Gray recently read before the Manchester Section of the Institution of Electrical Engineers [*ante*, p. 216]; and it also emphasizes some of the difficulties in this line of business. But we will leave them for the portion of the comments dealing with the supply of hot water for domestic purposes. We may just recall the effulgent encomiums poured upon the "Therol" water-heater at its advent and immediately after. Time has proved the truth of our adverse criticisms, based upon the application to its capabilities of the practical requirements of an ordinary household. No household is going to dispense with appliances that meet their requirements efficiently and readily for others that meet them only inefficiently. If this simple fact is grasped by our electrical friends, they will see that any appliance that is less economical and reliable than, and that does not answer all requirements as promptly as, existing methods cannot make much headway in use. Well, the "Electrician" now admits that the question of supplying hot water for domestic purposes presents a considerable barrier to the wholesale adoption of electrical methods. It also doubts if it is generally realized how much water is required in the average household. Further on, it says: "Whatever electrical method is adopted, there is no possibility of diminishing the quantity of heat required, and the consequent amount of energy necessary to effect the heating of water. It is possible, however, to supply that energy in a more or less convenient form. From the supply point of view, it is obviously distinctly inconvenient to supply the energy as and when the water is drawn off and more cold water has to be heated. If the energy is supplied in that way, the current required must be comparatively heavy at times, and, consequently, it cannot be supplied at a cheap rate. If, on the other hand, a considerable reserve of water is maintained at a high temperature and electrical energy is constantly supplied to this body of water, there is no reason why a comparatively small current should not be applied continuously to the work of heating. There would necessarily be some variation in temperature by this method; but if the water-tank is sufficiently large, these variations would not be inconvenient for domestic purposes, and the energy required could be supplied at a very low rate. It is essential that the charge for energy should be *very low* if this part of the problem is to be solved satisfactorily; and the only way out of the difficulty appears to be to arrange matters, on some such lines as those just indicated, so that a constant load is obtained." To say the least, this will not assist in inspiring any great amount of hope.

The reference to Mr. Gray's paper reminds us that the "Electrical Times" was passing a few criticisms upon it in its last issue in January; and we bow (for the purpose of hiding our amusement) before the profound knowledge of gas appliances, and some of their effects, shown by our contemporary. Mr. Gray was guilty of having made some experiments on the boiling of water by respectively gas and electricity; and the results were not favourable to the latter. Was the kettle used for gas, asks our learned contemporary, a new one, with a high polish only to be found before use, or had it (what nasty knock of ignorance is this?) that external coating of hard heat-resisting deposit which can be seen on nine kettles out of ten? Then there was the gas-ring. This is said to have been one of standard and modern design. But, says the learned commentator, in practice "people use the gas-rings fitted to their ovens; and heating from one of these is a very different matter from heating on this specially arranged gas-ring which, by the way, had an extremely small consumption—its maximum being only 10 cubic feet per hour. In practice, the kettle stands on a heavy highly-conducting grating with an enormous appetite for heat. The gas-flames invariably play upon that grating; and it becomes red hot in the vicinity of the flame. The grating has a large radiating surface, and is also cooled by contact with the heavy surrounding frame metallically connected to the body of the oven. A prodigious amount of heat is obviously dissipated in this manner." All this is excellent. A little later on, we are told that "gas-ovens have to be black because gas is productive of dirt; and they have had to be capable of taking heavy lagging because they have to be black; but the electric oven, which will ultimately gain the day, will be of the light polished variety, with a small heat storage capacity, with low losses, and capable of being heated up to a high temperature in a few minutes." In other quarters we have been told that imagination is a priceless asset in connection with certain halfpenny daily papers.

If imitation be the sincerest form of flattery, then some of our home municipalities owning electricity supply undertakings should feel elated over the fact that the Wellington (N.Z.) City Council have lately been taking a leaf out of their books. The excuses and fables that are introduced by electrical people for making widely differing prices for electricity would cause many an honest man blush. There is the case at Hastings. Members of the Council, and the Electrical Engineer, as will have been remarked from the Local Government Board inquiry reported in our pages last week, stand up and say that there is justification for charging 4d. per unit for the public arc lamps and only 2d. per unit for the metallic filament ones—that is to say, it is quite correct that the arc lamps should be charged for current at 100 per cent. more than the metallic filament lamps. Why the metallic filament lamps should be favoured over the arc lamps, is not clear. Mr. Ferguson says that they can supply the metallic filaments cheaper because, when they are in use, current is not required for any other purpose. Has the reporter erred? The greater number of the metallic filament lamps are surely employed from dusk through the long lighting hours of the winter. Then what does Mr. Ferguson mean? Following the statement to its logical conclusion, it is a contention that the less business that is being done, the cheaper the department can supply. That being so, may we suggest that everything possible should be done to discourage more lighting consumers being connected to the cables; for it follows that they only make generating costs heavier. The Electrical Engineer's argument wants clarifying a little.

We turn to Wellington (N.Z.). There precisely the same game is being played by the Corporation Electricity Department as in many places at home. The matter was referred to in the "JOURNAL" last week; but the illustration of the crookedness of the business methods of electricity supply by municipalities from such a distant part is rather interesting. It is the Hastings workhouse business all over again. At Wellington there is a Hospital Board, with several members of the City Council upon it. A proposal was made to enter into a new contract with the Gas Company; and a tender of theirs offered to put the gas installation into modern condition at a cost of £300 (the present cost of gas, at a special rate of 4s. 7d., amounting in all to about £300 a year). Then up and spoke the municipal representatives; and the Electricity Department were invited to tender. They did so, and overshot the mark. Their cost for installation amounted to £700; and the annual cost of current to £503, at 5d. per unit—the ordinary charge to the largest consumers. Our information does not enlighten us as to candle power of the lamps offered, and so forth. But municipal influence, which seems to blight all fair and direct competition between private gas supply and municipal electricity supply nowadays for public purposes, obtained another chance for the Electricity Department; and as the result of deliberation over their figures, they were reduced to £600 for installation, and the annual cost to £275, at 3d. per unit. But it seems from particulars to hand that a large proportion of the gas included in the £300 is employed for heating purposes. That being so, the Electricity Department have yet to show how the Hospital Board will be in a better position under their offer. The public themselves also want to know why the Electricity Committee can afford to supply the Hospital Board at 3d. per unit, while their largest consumers, the Government and the Harbour Board, are paying 5d. per unit. We hope that the sense of justice of the public of the city will not allow their representatives on the Council to commence the tactics so freely adopted at home, with the view of stamping out all fair competition between municipal trading and private enterprise. Let one be placed on an equality with the other in the matter of contracting, and not permit one side to pursue an indefensible course such as is illustrated here. Municipal trading was never authorized with the view that, from its position under municipal authority, it should be used to rend into pieces private enterprise—and private enterprise in this instance that contributes so much to the local exchequer, supplies extensive employment, and thus does much for private trading in other directions. In proportion to the capital expended, the influence on local finance and employment of a gas undertaking is much greater than that of an electricity concern. That is a point worth thinking over by the municipal representatives of the poorer sections of any community.

Last Friday, the second Vernon-Harcourt lecture to students of the Institution of Civil Engineers, was delivered by Mr. W. Henry Hunter, M.Inst.C.E.; his subject being "Rivers and Estuaries." On the 17th and 24th inst., Mr. James Swinburne, F.R.S., will deliver two lectures to students on "The Uses of Chemistry in Engineering."

THE INSTITUTION AND ITS APPEAL FOR FUNDS.

By Arthur Valon, Assoc.M.Inst.C.E.

In the last issue of the "Journal" it was stated that a meeting of gas companies' representatives had been held, at which it was decided to organize a Gas Companies Joint Exhibit at the forthcoming Coronation Exhibition at Shepherd's Bush; and it was contemplated as probable that an appeal would be issued to gas companies generally for sufficient funds for the purpose. That such exhibitions, if properly carried out, are of substantial value to the industry, few will be disposed to contest; but the advantage derived depends upon the value of such an exhibition as an advertisement. This would appear to fall within the objects for which the Gas Publicity Committee has been appointed; and it would seem probable that a second request for subscriptions from a different body for a substantially similar purpose, cannot fail to damage the prospects of the Publicity Committee's appeal. That two such appeals should be necessary in so short a time, shows once again the importance of the formation of a definite fund, which would be available for all purposes of communal interest and advantage to the industry.

There can be no doubt that constant appeals for funds for different objects are bound to have one end—the wearying of those to whom they are addressed, and resulting failure to obtain the desired answer. That this is felt by the Council of the Institution of Gas Engineers may be surmised from the fact that they have tacked on to the Publicity Committee the Special Purposes Committee; and the contributions now asked for are to cover also the fund for special purposes, for which a separate appeal has hitherto been issued, with not very successful results.

It is to be hoped that the value of advertisement will make a more effective appeal to the self-interest of the undertakings; for everyone acquainted with the facts must agree that the active campaign already instituted by the electricians must promptly and energetically be met. One tale is good until the other is told, and *ex parte* statements, either uncontroverted or ineffectively countered, are taken to be truth by the general public, to an extent which those in possession of the facts find it difficult to believe.

But apart from this matter of publicity, there are other questions of great importance to the whole industry which urgently require to be dealt with—such as those, for example, which the Institution of Gas Engineers are endeavouring to do something towards solving, so far as they are able, with the totally inadequate funds at their disposal, and others of great commercial importance which have not so far been touched at all. Nothing, however, can be done in any of these directions without adequate funds; and it cannot be gainsaid that, as the advantage will accrue to all undertakings, so all should contribute. But it is often extremely difficult to get the board of a small undertaking to realize that their particular interests are really bound up with the interests of the whole industry, and that they stand to gain any real advantage by combination; while larger undertakings, with more reason, feel themselves capable of dealing with problems as they arise by their own unaided efforts. Very frequently there is also, unfortunately, a feeling that it is not necessary for them to do pioneer work themselves, although they may be ready enough to take advantage of that which is done by others.

It is true that the cost of research has often in the past been borne by individuals, while the harvest of their labours has been reaped by the industry at large. But the problems which have now to be dealt with are increasingly of a character which cannot be solved satisfactorily by individual detached work, but require concerted and co-operative endeavour; while there are many matters of commercial organization which can be dealt with more efficiently and more economically by co-operation than by a large number of detached undertakings working separately.

The essential requirement for work in any of these directions is the possession of sufficient financial resources. In addition, it is also fundamentally necessary that the separate undertakings which compose the industry should be linked-up by an organization which will enable effective joint action to be taken for objects of mutual advantage, and it will probably be found that, unless such an organization can be formed, it will be impossible to obtain the requisite funds. It may be said that the organization exists in the Institution of Gas Engineers. But the Institution is not only a purely professional association, but does not even contain representatives of all branches of the industry. Mr. J. W. Helps, in his Presidential Address to the Institution last June, advocated the admission to the Institution of the heads of all departments of a gas-works, in addition to those qualified under the present rules; yet, even with such an enlarged constitution, it would still be a purely professional body, and would hardly seem to have authority enough, or to be sufficiently representative of all the interests in the industry, to enable it to obtain and administer the necessary funds.

"No taxation without representation" is an old constitutional maxim, well worth remembering; for the principle it enshrines is applicable to many things besides Imperial taxes. It is not easy to obtain a regular yearly revenue from voluntary contributions for objects which make a definite appeal to a wide public, and where the results can be easily seen and appreciated. But when the appeal has to be made to exactly the same contributors, year after year, and the results of the expenditure cannot in the nature of things be either spectacular or sensational, and when above all the rate of contribution has to be settled by someone other than the contributor, it is not difficult to see that the task will quite probably prove impossible.

If what has to be done is to be done successfully, the active support must be enlisted of those who are responsible for the ultimate control of the gas undertakings of the country. This was indeed stated in the presidential address to which reference has already been made; and it was suggested that a meeting of directors should be convened. Such a meeting might be a useful means of arousing interest in the first instance; but without some permanent organization to enable the contributors to the funds to keep in touch with the work that is being done, and with some power over the expenditure, it does not seem very probable that the required amount will continue to be obtained, while without such an organization there can be no hope of the advantages which concerted action is necessary to get.

Why should not the Institution be widened so as to represent the financial interests in the gas industry, as well as the professional or official element, and thus become completely representative? Such an institution would have authority to deal with matters affecting industrial interests, such as no purely professional association could ever expect, while the difficulty in regard to funds should disappear. It is not suggested that membership should be opened to all directors or shareholders (although such an extension might possibly result in an increased subscription roll), but that all undertakings subscribing to the funds should be entitled to appoint a member of the directorate to represent them in the Institution—all such representatives to enjoy the ordinary privileges of membership, as well as to exercise certain special powers in regard to finance. The contributions from the various undertakings would, of course, form a special fund; such contribution being calculated according to the size of the undertaking—that is to say, at so much per thousand or per million cubic feet of gas sold. The rate of contribution would be decided by the representatives of the contributors alone, after having considered estimates submitted by the Council, and sanctioned the objects and extent of the expenditure. The voting power of each representative would need to be proportioned in some way to the size of the contribution from the undertaking represented, as it is in the case of companies where voting power is proportional to the value of shares held.

The Council might be elected by the professional members and by the representatives in certain definite proportions; or it might be found better to retain the existing Council, leaving the representatives to appoint a separate Executive, and then to have a Grand Council of both sitting together for certain purposes. But these are matters of detail which can easily be solved if the principle is accepted. That such a reorganization of the Institution of Gas Engineers will materially interfere with its objects as hitherto conceived, may be true enough; but this should not stand in the way if the objects which it is proposed to substitute are of more importance. After all, the original purpose of a body such as the Institution, was to give opportunity for the reading of papers on technical matters; but this function has, to a very large extent, been superseded by the Technical Press; and detailed technical discussions are probably better conducted in smaller meetings, such as those of the District Associations than in that of the central body. Certainly, of late, there has been an increasing tendency for the Institution to devote its energies to matters of general interest, by appointing Special Committees to deal with special subjects; and it is only the want of funds which has prevented this tendency being still more marked. It is impossible in an annual meeting of a few days to discuss seriously a large number of technical papers; and if these were reduced in numbers, or entirely superseded, and the time occupied in discussing the reports of committees and research work conducted by the Institution, there might be much gain and perhaps little loss. Is it too much to hope that the industry will awake to the necessities of the situation before the opportunity has passed away?

THE DEFECTS OF AN INSTITUTION.

By "Assoc.M.Inst.C.E."

In the "Journal" last week, under the heading of "The Functions of an Institution," it was endeavoured to be shown that there was a danger in the delegation to others of the duties which each individual member owes to his profession collectively; and, further, that the first function of a professional society was, in the writer's view, the creation of a bond of unity, and of mutual interest between all and sundry of its members. It was not expected that the views expressed would find, in the same issue of the "Journal," independent and, to some extent, corroborative illustration. But such, in fact, turned out to be the case. For, on the adjoining page, a "Correspondent," in connection with "The Co-Operative Publicity Movement," feared that "combined action in the British gas industry for the protection and the advancement of its interests 'might' prove abortive for want of adequate support;" and he later on pointedly asks, "Is there real driving power in the industry?"

If that question had to be answered by the writer, it would be with an unhesitating and emphatic "No;" and he is inclined to think such a reply would not be an isolated one. If the same question were to be fearlessly and honestly considered by the gas

industry at large, there would be a fairly loud chorus of voices to the same effect.

Still further was to be found in the "JOURNAL," what seemed to the writer to be an apt illustration of his views—a slight remark, but one which he thinks sheds a flood of light upon the dark aspects that he was humbly pondering. The remark was in the "Editorial Note" on "The Publicity Campaign," and referred to the sending of the circulars relating to it to the Chairmen and not to the officers of the undertakings, because there was "difficulty in a number of instances of deciding whether to address the Engineer or the Secretary—it being fatal to all chance of success to choose the wrong alternative." Small though the point is, it throws a piercingly illuminating dart into the very heart and weakness of the industry—and the frailty of its human elements. Can it be possible? Is it conceivable that upon whether a circular, drafted presumably for the good of a great industry, be addressed "Engineer" instead of "Secretary," or *vice versâ*, depends success or failure of a cause? If it be so, although the gas industry be powerful, its officers must be petty indeed. Let us, if only for respect sake, hope such things cannot be.

But are there not certain defects which may fairly and frankly be examined; defects common in some degree to all professional societies, but of particular bearing, perhaps, in regard to the representation of the gas industry? The calling suffers in many respects in comparison with other branches of engineering activity, and from a variety of causes—historical, inherent, personal, social—which cannot now be considered. But the *gazier* (to use an embracive French word, for which "gas man" is hardly equivalent) appeals to a very wide sphere of interests and occupations, and his representative Institution should be correspondingly comprehensive and broadly based. For instance, it concerns the chairmen, directors, and shareholders of the companies; the committees and ratepayers of the municipal undertakings; and all consumers. It interests coal suppliers and bye-products buyers. It depends on manufacturers and contractors for anything and everything, from the simplest article to the most complicated apparatus. Outside the gas-works' gates, a whole retinue of trained artisans, commercial agents, and business men link up the industry to the world of consumers. Inside the gas-works' gates, a small number of engineers and managers represents "officialdom"—and themselves; and, if you please, they only are the called and chosen, out of a vast army of gas workers and users, to be gathered into a select and sectional group, having the duty and the pretension of "representing" the gas industry. Latterly, it is true, divisional societies have arisen based on trade or geographical considerations; but the broad fact remains that the gas industry, as a whole, has (as the "JOURNAL" pointed out as far back as July 20, 1909) nowhere any organized and representative institution. It is a big body without any head. What organization and representation there is, is but partial and sectional. That may be said to be the first fundamental defect, and one, moreover, of which years ago warning was given.

As a consequence of this initial defect, of course, there can be no effective motive power urging the scattered gas forces into any direct and profitable channel. No wonder a "Correspondent" asks: "Is there real driving power in the industry?"

As there is no force, so there is no cohesion between the various units; even between the units of that small (and, in some respects, insignificant) technical and sectional branch which has attempted some incorporated life—a life still so imperfect that it may wreck itself and good causes, as has already been noted, upon the rock of elemental pettiness and jealousy. The isolation of individual gas engineers and managers has, no doubt, through long years of monopoly and power, contributed to this.

Again, what effective organization is available for instant action even within the narrowest range? Committees meet, committees talk, and committees decide; but what is there to turn the talk into deeds, and the decisions into actual accomplishments? It may be urged, want of funds cramps everything. Then, where is vitality shown? Progress has certainly been made in the gas industry, and great progress will continue to be achieved; but it will be (unless things are altered) wholly by the strength of individual effort, and in spite of defective corporate organization. Where is there any openness of motive and promptness of striking in dealing with the problems and the difficulties of the industry and the fighting forces of its competitors? Is there not, on the contrary, a secretiveness of methods and a sluggishness of conduct? Did not the "JOURNAL" only quite recently refer in an "Editorial Note" to the secrecy that was apparently shrouding consideration and inquiry concerning some presidential proposals for reform?

All these are questions that, for all the writer knows, may be answered one way or the other. Perhaps they may not be worth putting or answering at all. But the mere fact that they voluntarily suggest themselves to one may indicate that they have occurred to others, and may not be altogether futile. At the least, they are put by a well-wisher for the good progress of the gas industry, and with a desire to see a strong and effective instrument available for the beneficial objects for which it exists.

The Yorkshire Junior Gas Association, by invitation of the President (Mr. F. Scholefield), will visit the Dewsbury Gas-Works next Saturday afternoon, the 18th inst. Subsequently, Mr. C. D. Cawthra, of Halifax, will relate a few experiences in connection with the alteration of hydraulic mains.

THE FUTURE OF THE GAS INDUSTRY.

By R. W. E.

WHAT is the future of the gas industry? Is there to be a continuance of its prosperity in the coming years? What are the requirements of the future? Are we working on the right lines? I unhesitatingly conclude (undoubtedly) the future of gas is full of promise; but as to the coming requirements and methods, I feel these are points requiring more consideration. The action of the Institution of Gas Engineers in regard to the publicity scheme indicates the trend of affairs. We are realizing that competition faces us, and that it is not likely to become less severe in the future. Will this publicity scheme have the effect of nullifying in any way individual efforts? May it have the effect of influencing some to depend entirely on the work of the new scheme? I fear so, but hope not.

The publicity scheme will be of small use unless each gas undertaking supplements its work by individual effort in every respective district. The Publicity Committee will be of little good unless it is supported by local effort. Each undertaking must carry on educative work in its individual district. The local requirements, conditions, and circumstances vary; and it is necessary for these to be thoroughly appreciated by those on the spot, as what is food for one may be poison for another. We have got to shake off old ideas and methods. The gas industry as a whole has not been behind in this respect, although, without reflecting on our forefathers, it might be said that in the old days, before competition was felt, obtaining business was rather looked down on and described as shop-keeping. A well-known manager of the old school once compared some advertising to "quack medicine advertisements;" and this received the approbation of the shareholders of the gas company at whose meeting these remarks were made. Although the incident happened but a few years ago, the remark would not be approved of to-day by either gas shareholders or engineers.

The advent of the sliding-scale and auction clauses in 1875 had the effect of bringing many companies up to date; and not only did the consumers reap a great advantage in lower prices for gas, but shareholders received higher dividends. To-day the sliding-scale is a valuable factor in governing the economic policy of gas companies; and there are but few undertakings now working under the maximum price. Whether the sliding-scale is now as equitable as it was intended, I have my doubts. In many companies the consumer derives five or ten times more benefit than the shareholder; and this is sometimes more marked where co-partnership has not been adopted, because (presuming all the ordinary capital to be under the sliding-scale) the division is more balanced. Again, some companies find it advantageous to have differential rates for various purposes. Therefore, such a company, with low capital, and no co-partnership, would be at a greater disadvantage.

Take the following example: A company with a 3s. standard is selling gas at 30d. per 1000 cubic feet, subject to rebates for special purposes, and supposing the proportion works out at—

			s.	d.
40 per cent.	lighting at 30d.	. . . . .	1	0
40 ,,	cooking } at 24d.	. . . . .	1	0
10 ,,	heating }	. . . . .		
10 ,,	power at 18d.	. . . . .	0	1·8
			2	1·8

In such a case, while the dividend would be based on the difference between 3s. and 2s. 6d., or 6 × 2s. 6d. + 5 per cent. = £5 15s. per cent., the comparative actual selling price of gas ought to justify dividend based on 2s. 2d.—that is, 3s. − 2s. 2d. = 10d. × 2s. 6d. + 5 % = £6 5s. per cent.—a difference of 10s. per cent, Against this, an argument might be thoughtlessly advanced that in such cases companies might seek particular classes of consumption at low rates for the purpose of bringing down the average price sold. But the answer to this would be that, where differential prices are adopted, it can only be on the bases of identical prices for identical purposes or identical quantities. Undoubtedly, if one can adopt a flat-rate low enough to combat with every branch of competition, then differential rates are not so necessary. But to do this effectively means, if there is a power demand, to supply at an all-round price of 1s. or 1s. 6d. These rates, in the Southern counties at all events, are not possible yet awhile. Therefore, one of two things must happen: Either one is content to see suction gas used for engines and gas fires and cookers intermittently, or differential rates must be adopted to attract or secure all the business in these channels.

How few, if any, companies would hesitate to spend capital to obtain 500 slot consumers, assuming a mile of 5-inch main, costing £600, and £6 per house for service, meter, carcase work, lights, and cookers, making £3000 (a total of £3600), for an annual consumption of (10,000 cubic feet each) 5 million cubic feet? Yet there is hesitation in offering differential rates, which would have the effect of probably doubling the annual consumption of the ordinary consumer. Let us see the effect: Supposing that 300 ordinary consumers increased the average consumption 100 per cent. from 30,000 to 60,000 cubic feet per annum—one would secure an increased consumption of 9 million cubic feet, equal to 900 additional slot consumers, with the advantage of saving all capital, as one gets rents on cookers, fires, and meters, *plus* an increased consumption per service on the existing mains (the additional business

probably not necessitating larger mains, being chiefly a day load), and greater use of works, plant, &c. The only difference is more meters to inspect and book—accounts being the same. Surely it is worth it, especially as one may still go for slot consumers with the low averages.

My opinion is that if we do not do this now our competitors will undertake it in the near future, and we shall be left in the lurch. One has to present one's commodity in an attractive way. I recently visited an electricity undertaking, where I found a department devoted to educating the public to the use of heaters, cookers, vacuum cleaners, bed-warmers, and so on. Special rates are being offered—at one-third the ordinary lighting price—and are taking on. Moreover, Bradford is considering an interesting scheme by which electricity for heating, cooking, and power will be supplied at ½d. per unit. We may hold electricity in contempt so far as competing for cooking, heating, &c., is concerned; but I for one do not believe in such an attitude. "Grasp the nettle," &c. In the next year, we shall be in the midst of a huge fight—that is, if our Publicity Committee is worth its salt. The electrical world is also getting ready. Let us be ready too. Drop old facts and fancies; be ready to adopt new ideas and systems; and, above all, do not let a little more trouble and work stand in the way.

In concluding these few thoughts, may I throw out the suggestion as to the growing demand for high pressure. The day is not far distant when we shall require to supersede the district governor on the works, and supply high-pressure in the district—regulating the pressure on the inlet side of the meter. When this system is adopted, not only will it enable a more economical employment of our mains, but a more elastic use. High-pressure supplies can be given at any point, as well as low pressure. The drawback to high-pressure is the absence of a meter with twin dials—one showing the actual consumption and the other the corrected consumption, allowing for compression, &c. The use of such a meter would enable the consumer to better appreciate the situation than having to add 15 per cent. or so to the consumption shown by the high-pressure meter.

WATER BILLS FOR 1911.

[Third Article.]

We conclude to-day the notice of the Bills promoted by public bodies in connection with the supply of water.

The Metropolitan Water Board are applying for authority to purchase lands and construct a number of water and other works in the counties of Buckingham and Middlesex. They include eight storage reservoirs, to be situated in the parishes of Wraysbury, Staines, Datchet, Horton, Stanwell, Laleham, Littleton, Shepperton, and Sunbury; a service reservoir on Horsendon Hill, Greenford, and another on Barn Hill, Wembley, in the county of Middlesex; and a number of aqueducts, conduits or pipe-lines, and cuts. The Board require power to divert streams, construct subsidiary works, make, stop up, and divert roads and footpaths, alter the position of mains, and underpin houses where necessary. A period of twenty-five years is asked for the completion of the works specified. The Board seek authority to acquire lands in the parishes of Stanwell and Staines for the construction of filter-beds and other purposes; and they wish to have the powers conferred upon them, as successors in title of the Southwark and Vauxhall Water Company, for the completion of the pumping-station at Walton-on-Thames, and the aqueduct, conduit, or pipe-line described in the Company's Act of 1898, revived and continued until three years from the passing of the Bill. Authority is sought to abstract water from the Thames and the Colne Brook, to make agreements with the Conservators of the Thames and others in regard to the abstraction of water, and to use the water of the above-named brook for producing power. In view of the magnitude of the works proposed, the financial provisions of the Bill are necessarily somewhat formidable. The Board ask Parliament to sanction the raising of £6,900,000 for the purchase of land and the execution of the works specified; £1,000,000 for works to be carried out under their general powers; and, with sanction of the Local Government Board, such further sums as may be required for the purposes of the Act. Sixty years are required for the repayment of the first-named amount, and thirty years for the second; and the Local Government Board will fix the period for the redemption of the third amount. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Urban District Council of Oystermouth are applying for authority to purchase, by compulsion or agreement, the undertaking of the Oystermouth and District Water-Works Company, Limited, maintain the existing works and construct others, and supply water within the urban district of Oystermouth and adjacent places. If the purchase is not completed on the appointed day, the Council are to pay to the Company interest at the rate of £4 per cent. per annum on the purchase-money until completion. The new works for the construction of which authority is required are a service reservoir in the parish of Oystermouth; a conduit or line of pipes commencing in the parish of Bishopston, in the existing pumping-stations of the Company, and terminating in the reservoir just referred to; and another pipe-line commencing at or near the Redley springs of the Company, and terminating at the existing pumping-stations. Authority is sought to purchase the sites of these stations and the easements for certain lines of pipes. The rates for the supply of water for domestic purposes are to be 6s. 6d. where the rateable value of the premises does not exceed £5 per annum; 8s. 6d. where it is not more than £7; 10s. when not above £10; and 5 per cent. on the rateable value when this exceeds £10. When the supply is by measure, the price is not to be more than 1s. 6d. per 1000 gallons. Supplies in bulk beyond the limits are to be furnished on such terms as may be agreed upon. The other powers sought by the Council are of the usual character. They require authority to borrow for the purchase of the undertaking of the Company, and for defraying the costs and expenses incidental thereto, such sums as may be necessary; for the purchase of lands and easements and for the construction of the reservoir and conduits specified, £4650; for the extension and improvement of the water undertaking, £2800; for the supply of fittings and working capital, £1000; and whatever amount may be needed to defray the costs and expenses of the intended Act. Fifty years are required for the payment of the purchase-money; sixty years for the £4650; and forty, ten, and five years for the three other sums mentioned. [*Parliamentary Agents: Messrs. Durnford and Co.*]

The Paignton Urban District Council are seeking authority to construct new water-works, consisting of a filter-house and filters in the parish of Holne; another, with filters, near the dam of the Council's Venford reservoir; and an aqueduct, conduit, or pipe-line commencing in the parish of Holne, and terminating in the parish of Ipplepen, by a junction with the existing main leading from the reservoir to Paignton. The Council require ten years for the completion of the works, and also confirmation of the storage reservoir and other works already constructed. They wish to be relieved of the obligation to supply water for domestic purposes for a shorter period than six months and for a less sum than that payable for one year. They will, however, supply by measure at a price not exceeding 1s. 6d. per 1000 gallons, with a minimum not higher than 10s. per quarter. Authority is required to raise for the purchase of land for the works specified and the construction of the works an amount limited to £27,500; and the Council ask for sixty years within which to repay it. [*Parliamentary Agents: Messrs. Baker and Co.*]

Application is being made by the Rhondda Urban District Council for an extension, by three years from the passing of the proposed Act, of the time limited by the Council's Act of 1905 for the carrying out of certain works specified in the Ystradyfodwg Urban District Council (Gas and Water) Act of 1896, and also for authority to construct new works, comprising two service reservoirs and filter-beds in the parish of Rhondda, a tank adjacent to the Council's Tyn-y-waun reservoir, and four conduits or pipe-lines. Seven years are required for the completion of these works. Authority is sought to raise £34,667 in respect of the works for which the extension of time named is needed, and £48,209 for carrying out the new works. A period of forty-five years is required for the repayment of these amounts. [*Parliamentary Agents: Messrs. Torr and Co.*]

The authority of Parliament is being sought for the establishment of a Water Board for the Rhymney Valley, and for power to acquire the water-works undertakings of the Rhymney and Aber Valleys Gas and Water Company, the New Tredegar Gas and Water Company, Limited, the Rhymney and Caerphilly Urban District Councils, and the St. Mellons Rural District Council, and the Pentwyn reservoir and other works of the Merthyr Tydfil Corporation. It is proposed to construct an impounding reservoir in the valley of the Taf Fechan, a service reservoir on the road leading from Fochriw to the village of Gelligaer, and another (to be called the "high-level service reservoir") on Merthyr Common, five conduits or pipe-lines, and three roads. A period of ten years from Jan. 1, 1912, is asked for their completion, and extensions of time by five years from the above-named date in the case of a reservoir and parts of pipe-lines which have not been constructed in the parish of Gelligaer by the Rhymney Company, and by three years in the case of certain works in the parish of Llanfabon. Authority is sought to take the waters of the Taf Fechan and a number of springs and streams, by means of the existing works and those specified in the present Bill. Provision is made for the supply of compensation water to the Rivers Rhymney and Taf Fechan. It is proposed that the Board shall consist of two members to be appointed be the Rhymney Council, six by the Gelligaer Council, five by the Caerphilly Council, three by the Bedwellty Council, and one each by the Mynyddislwyn, St. Mellons, and Llandaff Councils; and the Chairman and Vice-Chairman are to be appointed by and from the members of the Board, the number of whom may be altered by the Local Government Board on the application of any constituent authority. It is proposed to establish a Joint Committee of the Board and the Merthyr Coporation for the purpose of constructing the Taf Fechan reservoir and the works in connection therewith, and generally for the purpose of carrying into execution the powers that may be conferred on them by a special part of the intended Act. They are to be a separate body, and to have power to acquire and hold lands for the purpose for which they are established. As soon as the reservoir is ready for use, the Board and the Corporation are to take from the Committee such quantities of water as they may desire, but in neither case less than 2 million gallons of water per 24 hours. For any additional quantity required the charge is to be 3d. per 1000 gallons. The limits of supply are the whole of the urban district of Gelligaer, part of Caerphilly, and so much of the hamlet of Van, in the rural district of Llandaff and Dinas Powis, as is situated within the watershed

of the River Rhymney, in Glamorgan; the whole of the urban district of Rhymney, part of the urban district of Mynyddislwyn, the whole of the parish of Bedwas and part of the parish of Machen Upper, in the county of Monmouth; and such parts of the parishes of Llangynidr and Llanddetty as are within the watershed of the Rhymney. The rates to be charged are 2d. per week where the rateable value of the premises supplied does not exceed £4 per annum; 3d. per week up to £7; 4d. per week up to £10; and from £10 upwards the rates range from 10 down to 6 per cent. per annum according to the rateable value. Water-closets beyond the first and baths are, as usual, to be extras. The price of water supplied by measure is not to exceed 1s. 6d. per 1000 gallons. The powers that are usually granted to water suppliers are applied for. The Board ask for authority to borrow the money required for the purchase of the respective water undertakings, £485,000 for the purchase of land, £30,000 for subsidiary mains, &c., and £5000 for working capital; the periods required for repayment being fifty-five and twenty-five years respectively for the purchase-money, and sixty, thirty, and ten years for the three amounts specified. The purchase prices are to be determined, in fault of agreement, by arbitration. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Rotherham Corporation are applying for authority to construct a service reservoir on certain lands lying to the south of the Wortley Road, in the parish of Rotherham, and for a period of ten years within which to complete it. They also require power to make bye-laws for preventing the pollution of water, and to enter into contracts for its supply in bulk. They wish to have repealed the portion of the section of the Rotherham and Kimberworth Local Board of Health Act, 1863, which prescribes that the Corporation shall not be entitled to demand or receive in respect of water-rates for any one dwelling-house or part of a dwelling-house any higher sum than £10. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

A Bill promoted by the Slough Urban District Council is to obtain authority to acquire the undertaking of the Slough Water Company, maintain and enlarge the existing works, and make better provision for the supply of water in the district. In the event of the proposal being sanctioned, the Company will be wound up; but the Bill contains provisions for the compensation of the officers. The minimum rate for the supply of water for domestic purposes is to be 8s. 8d. per annum; and the Council are not to be compelled to supply for less than a quarter. They require authority to raise the necessary money to complete the purchase and pay the costs and expenses incidental thereto; also to sell a portion of their undertaking to any outside local authority whose district is within the Council's area of supply. [*Parliamentary Agents: Messrs. Baker and Co.*]

In a General Purposes Bill promoted by the St. Helens Corporation, they seek to be authorized to require security for the supply of water, and to recover in the same way as water-rents expenses incurred in the repair of meters, &c. It is specified that a supply of water for domestic purposes is not to include a supply to stables or premises in which horses, carriages, or motor-cars are kept for private use, if a hose-pipe or other similar apparatus is used for such stables or premises. Other provisions in the Bill relate to the detection of waste, the supply of water to houses partly used for trade, &c. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Swinton Urban District Council require authority to maintain their existing water-works and construct additional works, consisting of a well, pumping-station, and filter-beds, a conduit or line of pipes, and an enlargement of the existing storage reservoir; and they ask for ten years for their completion. Power is sought to supply water by measure, revise the present water-rates and allow discounts, sell or let meters, make provision for the detection of waste, and hold lands for the protection of the water-works. Permission is sought to borrow £10,000 for the purchase of land and the construction of works, to be repaid within sixty years. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Conservators of the River Thames have promoted a Bill for the amendment and consolidation of the various enactments relating to the abstraction of water from the Thames by the Metropolitan Water Board and to the payments made by the Board to the Conservators in respect thereof. As an understanding has lately been come to between the two bodies, considerable modification may be made in the provisions of the Bill if it is proceeded with. [*Parliamentary Agents: Messrs. Wyatt and Co.*]

Masonic.—One of the Past Masters of the Evening Star Lodge, No. 1719—W. Bro. Thomas Cash, of Birmingham—has been offered and has accepted the Junior Wardenship of the Jubilee Masters Lodge.

Society of British Gas Industries.—The arrangements for the annual general meeting of the Society, to be held at Leeds on Friday, the 3rd prox., have now been completed. By permission of the University Authorities, the meeting will take place in the Hall of the University; the "General Business" being transacted at 2.30 p.m. At 3.30, the new President, Professor Arthur Smithells, F.R.S., will be introduced; and at 3.45, he will deliver his address. Subsequently, a paper will be read by Mr. Thomas G. Marsh, of Manchester, entitled "The Gas Industry—A Retrospect and a Forecast." At 7 o'clock, the members and visitors will dine together at the Great Northern Hotel. The following morning, there will be a visit to the University.

PHYSICAL RESEARCH AND ENGINEERING.

The Junior Institution of Engineers always try to have, at their annual dinner, a happy combination of entertainment and speeches containing the loftiest of ideals and educative inspiration. The reason of this is that the Institution has gained the sympathy and encouragement of the foremost in the scientific and technical world, who have bond or lot with and in engineering. Their presidential roll records a long line of Presidents whose names are as household words among us. The President this year is Sir J. J. Thomson, F.R.S., Cavendish Professor of Experimental Physics at Cambridge; and he presided at the annual dinner on Saturday evening at the Hotel Cecil. Adjacent to him were noticed the Rt. Hon. Lord Justice Fletcher Moulton (a Past-President), Sir William Crookes, Dr. John Perry, F.R.S., Professor of Mechanics and Mathematics at the Royal College of Science, Mr. Alexander Siemens, President of the Institution of Civil Engineers, Mr. S. Z. Ferranti, President of the Institution of Electrical Engineers, and others. In the absence through illness of the Chairman of the Institution, the Vice-Chairman (Mr. B. E. Dunbar Kilburn, M.A.) occupied the chair facing the President. Mr. W. T. Dunn, the Secretary, had, as usual, made perfect arrangements for the event. After dinner excellent music and songs interspersed the speeches, the latter of which showed the correlation of physical research and engineering.

Lord Justice Fletcher Moulton held his audience while submitting the toast of "Physical Research;" and there was almost breathless silence while he carried thoughts to things that are almost beyond human grasp—certainly beyond the grasp of the ordinary intellect. But it all showed the infiniteness of things, and the immensity of the great storehouse of Nature which human intelligence has yet to explore. He stated concisely the work of the engineer, and recognized the loyal affection and devotion of the engineer to physical research. The laboratory experiments of to-day are the engineering of to-morrow; so that the engineer's devotion to physical research is not entirely unselfish. The engineer has not the key to the great stores of Nature; and it is only from the little that is left out upon the shelf that the engineer can perform his part. The great storehouse of the forces of power is still, in greater part, inaccessible to the engineer. The last fifty years, from the time of Faraday onwards, has been the period in which physical research has been more assiduous, more valued, and more richly crowned with success than in any other during the world's history. No doubt before that time chemistry had done much; and there had been workers in the domain of physics who had laid the foundation of what was to follow. But fifty years ago nobody could have formed any conception, in his wildest dreams or imagination, of the advances that would be made in physical knowledge during the succeeding half century. Then those who listened were carried by word and thought through some of the wonderful triumphs of the period. They have brought to light certain of the fascinating peculiarities of the world in which we live. But the area for research into the infinitely small and the infinitely great is vast. And the last words of the speaker, in a speech long, but not too long, elevated in thought, and bringing to focus some of the lines of work proceeding in penetrating the immeasurable unknown, were "we ought to speak of physical research not only with enthusiasm, but almost with awe."

Response was made by the President, who acknowledged that when he commenced to study the subject of electrical discharges, there was no paper that aroused his enthusiasm so much as one written by Lord Justice Moulton in conjunction with Mr. Spottiswood. Having referred to the fact that the forces of Nature are the raw material on which engineering is built, he said that, if it were not for the knowledge of the forces of Nature, he supposed that engineering would come to an end. The results that have been obtained in physics, all seem to him to be of the highest of tributes to what human intellect can do. But physical research and experiment are difficult. It took centuries before any clear idea, or any clear conception, of the forces of Nature was arrived at by which extension was made of our knowledge of mechanical phenomena. It was then only the exceptional man who introduced a new point of view. Great discoveries have been made by men working merely to satisfy their own curiosity, and who had no idea of anything else. But it is men like these who have altered the whole trend of scientific thought. It is the man who says the first word who has often caused a complete revolution in thought and in our general conceptions. It is not, however, the great pioneers who are the best agriculturists; but there are many more men who have the power to follow up a clue and develop it, and work it, until it is a practical application. He thinks it possible to increase not only the number of these men, but the efficiency of the circumstances under which they work. The past twenty-five years have seen some enormous advances in the opportunities for research. There are to-day a great number of studentships and scholarships in research; but the difficulty is to find the men to fill these scholarships. To alter this, in his opinion, the scheme of education requires modification, in order to make boys think and be keen. The most successful examinee is not always the most successful when he comes to research. The best research man is one who puzzles over things, and who, when he sees something he does not understand, is not content until he does understand it. The President therefore looks to a change in the educational system to advance research in this country. While acknowledging, too, the great assistance that has

been given to research here, he does not think we have reached the point so far attained by certain other countries. There is, he later remarked, a great difference between the work of the physicist and the engineer. The work of the former is done when it reaches the "Transactions of the Royal Society." Then the work of the engineer commences; and it is the more difficult work.

Dr. John Perry, in proposing "Engineering Progress," said that he was not altogether sure that the systematized manufacture of research men was really a good thing. The true man of research must be one who is drawn to it from the pure love of the thing. He looks to engineering progress being largely developed by young engineers. In his reply, Mr. Alexander Siemens claimed that the marvellous progress of research is due to engineers; it is the engineers who have made research possible. In his opinion, the progress of engineering will be as great in the future as in the past. The toast of the "Institution of Junior Engineers" was proposed by Mr. Ferranti; and he spoke against the iniquity of the last Patent Act, in that it does not give, owing to the stipulation as to compulsory working, any sufficient protection to the inventor who takes out patents as he proceeds with work the completion of which may occupy a series of years. Reply was made by Mr. Kilburn, the Vice-Chairman. A subsequent toast was "The President," which was proposed by Mr. William A. Tookey.

It was altogether a most enjoyable evening, both from the intellectual and entertainment points of view.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Stepney Gas-Works.

On Saturday afternoon, the members of the London and Southern District Junior Association paid a visit to the Stepney Works of the Commercial Gas Company—the "home" of their President, Mr. L. F. Tooth. On arrival they were met and conducted over the works by Mr. S. W. Ludbrook, Engineer-in-Charge, Mr. A. H. Kelday, Superintendent of the Distribution Department, and Mr. Tooth. Altogether, a very pleasant as well as an instructive afternoon was spent by those who joined the party; not the least enjoyable part of the proceedings being the tea of which the visitors were hospitably invited to partake.

As this was not the first occasion on which the Association had visited these particular works—they having been there some three years before—and a full description of them having already appeared in the pages of the "JOURNAL,"* it is unnecessary to give here any general account of what was seen during the tour of the works on Saturday. The members visited the retort-house where the discharging is carried on by Mr. S. W. Ludbrook's patent pusher, which was seen in operation. The one great feature of the machine is its simplicity. On the present occasion, however, special interest was imparted to the inspection by the fact that the President was able to show the members in operation the metal furnaces to which he referred at some length in the course of the address he delivered to the Association some two months ago. There are two of these furnaces in a small foundry, in which the Company make their own castings, not only for gas-fittings, but for many other purposes as well. In this way the Company themselves make a large proportion of the fittings they require; the operations of lacquering and bronzing and finishing being carried out on the premises, in addition to the casting. The shop in which these operations are performed was inspected by the members, for whose benefit men had been kept at work during the afternoon. Various beautiful fittings so made were seen, and much admired; and it was explained that the making of these goods on the works was a great advantage owing to the widely differing requirements of the consumers in their district. In this department, particular attention was drawn to a freshly completed specially designed three-light pendant, made to meet the wishes of a certain customer. Finished in old style, and antique coppered, with the three early pattern lanterns, it is a striking piece of work, and must be voted a credit to all who have had anything to do with its manufacture. But, as already remarked, the castings are by no means confined solely to gas-fittings; for samples of other things turned out on the works were also shown—among them some lead pots. Before leaving the general machine-shop, where the members saw the various things just referred to, it may be stated that there are installed here the two compressors by means of which gas is raised to the pressure requisite for the efficient working of the furnaces.

In and around the foundry, a good deal of time was spent. Being of small dimensions, it was not possible to accommodate all the members inside during the demonstration; but the ample window space allowed those who were outside to see quite well all that was going on. Both burners and furnaces are in accordance with patents taken out by the President, who is devoting a great deal of attention to the application of gas to metal melting and kindred purposes. The two furnaces are of the regenerative cupola type—one taking a charge of from 200 to 250 lbs., and the other of 60 lbs. The larger has a consumption of 420 cubic feet of gas per hour; and the smaller one, 300 cubic feet. In fact, using the same patent burner in both cases, the consumption of gas is found to be about half what it was when furnaces without regeneration were employed. The time taken to melt a charge depends, of course, upon the particular metal of which it consists. But with brass, a 60 lb. charge is reckoned to occupy half-an-hour, and a 250 lb. charge an hour to an hour-and-a-quarter. This is starting with the heats up. The first charge—that is, starting cold—in the 60 lb. furnace would take from fifty minutes to an hour, and in the larger furnace about an hour-and-three-quarters. As a matter of fact, the members saw on Saturday a charge of 205 lbs. of brass melted in the large furnace, starting hot, in 55 minutes, for a consumption of 385 cubic feet of gas. They also witnessed 60 lbs. of metal placed in the small furnace, taking 27 minutes to melt, with a consumption of 150 cubic feet of gas. During the time the metal was in the furnace, they watched the brass founder make a mould, into which the charge was subsequently run.

The gas is supplied to the furnaces at a pressure of from 10 to 14 inches of mercury, according to the heat that may be required and the metal that is to be melted. The furnaces are sunk in the ground, in order that they may be easily get-at-able for the withdrawing of the metal; and if necessary temperatures can be recorded to well over 1700° C. Overhead travelling tackle is provided for taking the pots out of the furnaces; but in the case of the smaller one, this work is usually performed by hand. It is claimed that the gas process secures a great saving of time (more than one-half) as compared with the ordinary brass coke foundry method; and Mr. Tooth points out that, if this and the cost of fuel and other advantages are taken into account, the cost of gas working is only about one-half that of coke. In addition to the present cupola furnaces, it is intended later on to put down muffle furnaces for enamelling; and, indeed, in view of what has already been accomplished, and of Mr. Tooth's enthusiasm in the matter, it is only natural to look for further interesting developments in the utilization of gas in these directions at Stepney.

In the matter of mantles, the President drew attention to some samples of the "Elastic" upright and inverted patterns which are being marketed by the Hotton Lighting Company, and the special feature of which is their extreme flexibility. He showed that it was possible to push the mantles into all sorts of shapes without causing any damage whatever to them.

After tea, Mr. S. A. Carpenter moved a vote of thanks to Mr. Stanley H. Jones (the Engineer of the Company) for so kindly allowing the Association to visit the works. The special feature that had struck them that afternoon was the system of metal smelting by high-pressure gas—a method somewhat unique in gas companies' operations. Mr. J. Hewett seconded the vote, which was heartily accorded.

Mr. Ludbrook, in thanking the Association for the vote, said that it gave the Company a great deal of pleasure to receive the Association at their works that afternoon. He had to convey to them the regrets of Mr. Stanley H. Jones for his inability to meet them, owing to an engagement he had in the country. They were that afternoon seeing an old works, not an up-to-date modern works. Yet they had been able to show them something new in the matter of metal smelting by the use of high-pressure gas, which he believed had a future before it. During the time he had been with the Company—which was about 35 years—the make had grown up from 600 millions to 3300 millions—a little more than five times as much. In those early days, their staff consisted of 12 persons, including the Engineer and Secretary. It was now 120; so that the staff had become ten times greater.

* See Vol. CII., p. 227.

The Coal Trade Last Year.—We have received from the offices of the "Colliery Guardian" a reprint of the "Review of the Coal Trade in 1910" which appeared in that publication in the first three numbers of the present year. An interesting section is the one in which the variations in the prices of gas coal during the year are recorded, and particulars furnished of the more important of the contracts (British and foreign) entered into. The prices for best coals opened at 11s. 3d. to 12s. 6d., and closed at 9s. to 9s. 3d.; seconds started at 11s. to 11s. 3d., and finished at 8s. 6d. to 8s. 9d.; and specials were 11s. 9d. to 12s. 6d. in January and 10s. at the close of the year. The book costs 6d. net.

Scottish Junior Gas Association (Western District).—A monthly meeting of the Western District Division of the above-named Association was held in Glasgow last Saturday evening—the President (Mr. J. Frazer, of Provan) in the chair. There was a good attendance to hear a paper by Mr. John Murray, of Glasgow, on "Retort-Settings and Gas-Producers." It was illustrated by lantern views; and it led to a good discussion, in which Mr. Alexander Wilson, and Mr. A. H. Whitelaw, of Glasgow, took part. Owing to the paper not being available for abstracting purposes before the meeting (it did not reach us till late yesterday morning), it has had to be held over, with the report of the discussion, till next week.

Value of Water Storage.—We have received from the Clerk of the Metropolitan Water Board (Mr. A. B. Pilling) the sixth research report by their Director of Water Examination (Dr. A. C. Houston), dealing with the comparative vitality of "uncultivated" and "cultivated" typhoid bacilli in artificially infected samples of raw river water, with more especial reference to the question of storage. Dr. Houston comes to the conclusion "that even a week's storage of raw river water is an enormous protection, and less than a month's storage an absolute protection against typhoid fever." He adds that "the possibility of London water conveying epidemic disease may be finally dismissed from the minds of the inhabitants of the Metropolis as a fear which, on convincing experimental evidence to the contrary, has at last been definitely proved to be baseless."

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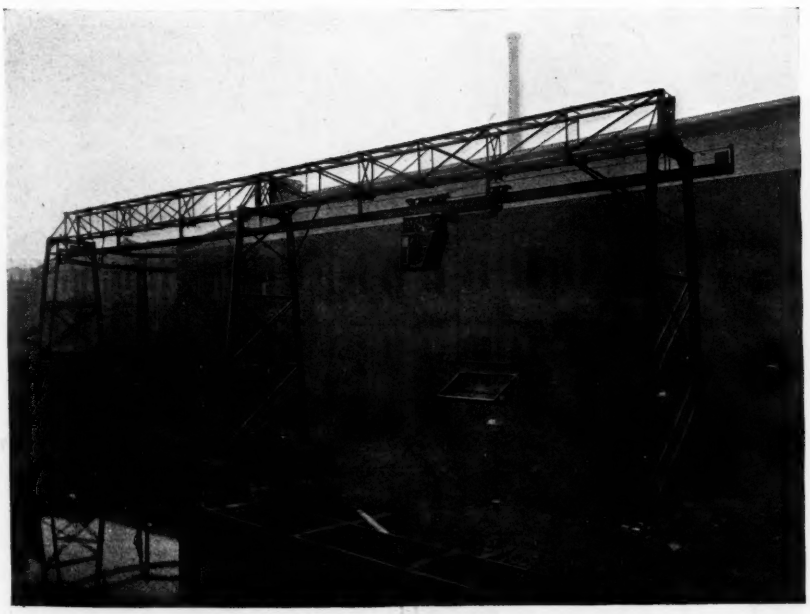

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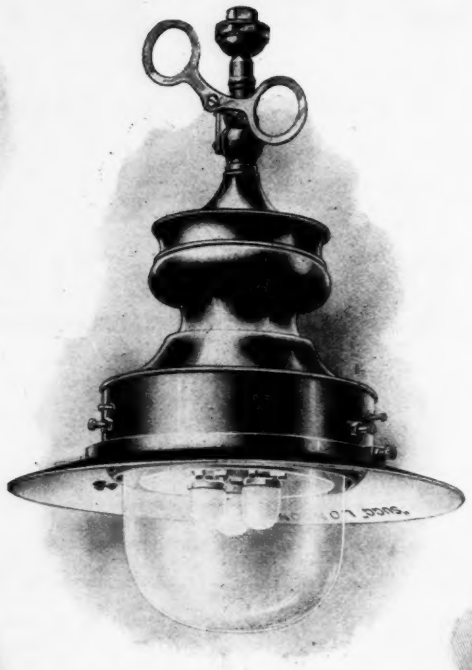

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COAL GAS AS A FUEL.

By H. James Yates, M.I.Mech.E., F.C.S.

[Extracts from a Paper read before the Liverpool Engineering Society.]

The subject, "Gas as a Fuel," with which this paper deals is one of so wide an application, that it is necessary to dismiss with little beyond a mere reference many matters to which, had time permitted, more attention might, not unprofitably, have been given. For the same reason, any historical review of former methods of employing gas as a fuel will be dispensed with, and the subject will be dealt with in its practical bearings as these exist to-day. And first of all, seeing that the use of gas as a fuel means that it is necessary to burn it, a few explanations regarding gas combustion will not be out of place.

Luminous and Non-Luminous Flames.

Gas flames are of two kinds—luminous and non-luminous; the latter class including flames supplied with air under pressure. There was at one time a notion, held by the man-in-the-street, that for the same amount of gas more heat was given out by a non-luminous flame than by a luminous one. At this time of day, it is not necessary to labour any refutation of this idea, beyond merely saying this, that if in both cases there is complete combustion of the given quantity of gas, then, of course, each flame develops exactly the same amount of heat. It is perhaps interesting to notice that although in a luminous flame, owing to its larger proportional volume, there is a lower average temperature than in a corresponding non-luminous flame, yet if a steady luminous flame can be produced, such as that given by a batswing burner, the flame has a thin outer envelope, where combustion becomes perfectly complete, and which develops a very high temperature. Indeed, this outer envelope is hot enough to melt a fine platinum wire; whereas it is difficult to do this in the bunsen burner flame—that is, of the ordinary kind. Professor Lewes states that the temperature of the hottest part of the luminous flame is 2116° C. Professor Wäggener and Professor Warburg both give the temperature of the bunsen flame as 1704° C.; and as the melting point of platinum is 1780° C., it can be readily seen why a platinum wire can be melted in the hottest part of a luminous flame and not in an ordinary bunsen. One other point where the luminous flame scores is in its higher power of radiation. The percentage of heat delivered by a luminous flame as thermal rays is somewhere in the neighbourhood of 18 to 20 per cent.; whereas a bunsen flame only averages 12 to 15 per cent. of heat delivered in this way. Where it is necessary to have the flame in contact with the object to be heated, a luminous flame is unsuitable. The reason of this is that the luminous flame, having no primary air supply as the bunsen flame has, is dependent on the contact of the flame with the air for the entire supply of air to support complete combustion. This contact is greatly interfered with by the interposition of the surface that is being heated. The heat liberates the carbon from the gas, but it cannot get access to sufficicent oxygen to enable it to burn, and, consequently, it is deposited in solid form as soot on the surface to be heated. This deposit, in turn, acts as a non-conductor, and greatly reduces the heat-absorbing capacity of the surface to be heated.

Considering the various types of non-luminous flame and the differences between them, if a start is made with gas burning in a bunsen burner and means are taken to prevent any previous admixture of air, a large flickering flame is produced. This is of little use for heating purposes, and rapidly deposits carbon on any cold surface placed in contact with it. A small admixture of primary air has the effect of making the flame even larger, though less luminous. Such a flame also is of very little use. It contains an interior zone which does not burn nor support combustion. A larger admixture of primary air gives a good non-luminous flame with a distinct inner cone. It is not possible to put a match inside this flame without firing it. In size, this flame is less than the former two. If the Méker burner, which has a metal grid, be employed, a still further admixture of primary air will cause a further decrease in the size of the flame and a more rapid combustion.* The inner cone is practically eliminated, and the result is apparently very nearly single-cone combustion. The heat from such a flame is very intense, and the burner is very efficient for every purpose for which direct-flame contact is necessary. If an attempt were made in the ordinary bunsen burner, without gauze or grid, to burn a mixture so largely composed of air, the flame would almost inevitably light-back. If in an ordinary bunsen burner the air be cut off until the flame is stable enough to remain at the top of the tube, it nevertheless makes a most unpleasant noise. This is caused by the imperfect mixing of the gas and air. The more highly aerated portions of the mixture will tend to light-back, owing to the velocity of the explosion backwacks being greater than the velocity of the mixture forwards; while in the less aerated portions of the mixture the case is reversed. There is therefore a continual oscillation of the inner cone, and consequent noise. In the Méker burner, this noise is entirely absent; the large chamber beneath the grid allowing perfect mixing, while the grid itself, which is of considerable depth, abstracts heat from the gases themselves so rapidly that back-firing is prevented. The Méker burner represents the extreme limits to which a simple injector atmospheric burner can be developed. To obtain a more intense flame still, it is necessary to force air into the mixture.

* The Méker burner was described and illustrated in the "Journal" for Feb. 9, 1909, (p. 375).

Radiation *v.* Convection.

The next consideration is that of the directions in which the burning of gas can be utilized for the purposes of fuel. The first of these in order is that of cooking; but this branch of gas utilization has now been so long before the public, and its ways and uses are so well known to almost everyone, that it is unnecessary to enlarge upon it. It is better to pass to other provinces which are as yet not so generally exploited or so widely known. Foremost among these is heating by gas, gas-heated hot-water supply, and gas-heating high-temperature furnaces for industrial purposes. It is probably not generally realized how great strides heating by gas has been making during the last two or three years. Formerly there was a strong prejudice, and a not unwarranted one, in the public mind against gas heating-stoves. People complained that they dried the air, and left the skin prickly and the mouth and nasal passages dry. The chief reason, which was not always very well understood, was that they were so contrived as to give the greater part of their heat by convection. That is to say, the metal of the stove was highly heated, and it in turn heated the air of the room. Another reason was that they often allowed part of the products of combustion to come into the room. In gas-fires, heat is given off from its source chiefly in two ways. One is radiation—*i.e.*, heat given off directly from the incandescent refractory material; the other is convection, which is heat given off from the body of the heating apparatus to the air of the room. Radiant heat has the faculty of passing through air without sensibly warming it, and therefore without loss. Its effect is to warm the walls and furniture, and these in turn very gradually bring the temperature of the air up to something approximating to their own. Convected heat, on the contrary, warms the air of the apartment, while leaving the temperature of the walls and furniture comparatively unaffected. Of these two forms of heat, radiant heat is now recognized by all scientific authorities to be by far the more healthful for ordinary domestic apartments. Somewhat cooler air, such as results where radiant heat is chiefly employed, is more healthy to breathe than warm air, which is the result of using convected heat. The warmer the air, the more it absorbs the moisture from the skin and mucous membrane. Further, it is possible to sit in a room heated by convection and yet feel chilled, because convection leaves the walls cool; and if one be near one of the walls of the apartment, it will quickly absorb heat from the body.

In the earlier days of the gas-fire, and indeed until only a very few years ago, these points were not understood by most manufacturers, and their gas-fires were designed with a view to convection chiefly; the red-hot fire-front being really introduced more to give a cheerful appearance than with any idea of the advantage of radiant heat. To promote economy, gas-fires were made with air-heating chambers and perforated fronts, so that air should be drawn in through these chambers, heated there by contact with the hot metal, and issue through the perforations into the room, and indeed too many stoves of this description, heated by convection in this way, are still being offered to the public. The new types of gas-fire that have brought about so great a change in the attitude of the public towards this form of gas heating, are, frankly, radiation fires. They have no perforations, no air-heating chambers, and convection is reduced to a minimum, and that at a low temperature, instead of the former high-temperature convection which caused all the discomfort. Consequently, they do not dry or unduly warm the air; and the highest percentage of the heat developed by the combustion of the gas which it is possible to utilize as radiation, is employed in this way. The figures expressing this percentage represent the radiating efficiency of the stove. In consequence of this entire change of the principle of design, the modern gas-fire as far exceeds its earlier prototypes in percentage of efficiency, and consequently in economy, as it does in healthiness and comfort; the highest radiating efficiency yet attained in the author's experience being registered as 55 per cent., by the testing apparatus originated and used at Leeds University. There is some reason, however, to believe that the apparatus does not register the entire heating efficiency; and with a further perfecting of testing apparatus, probably the figure would be found to be actually higher. It will be seen that gas for domestic heating has advanced from being a toy or a fad, and has become an immediately practical matter.

Formerly, when coal heating was to be replaced by gas, a gas-fire having an opening 10 inches wide, was generally put in place of the wide coal-fire. To have used a larger gas-fire would have meant an impossibly extravagant gas consumption; and yet the radiation was so small, and so much of its heat went up the chimney, that the room was not nearly so well warmed as by the coal-fire, and the ventilation was greatly reduced. The principle of the new gas-fire, however, has so economized the use of gas that the author has found it practicable to introduce gas-fires with openings 17 and 21 inches wide—an arrangement which affords adequate heating, and greatly increases ventilation without increasing the gas consumption; a 21-inch modern gas-fire burning even less gas than the old-type 10-inch. This wide-fire departure has had the further advantage of enabling the largest living-rooms to be heated by gas—a thing quite impossible with the narrower gas-fires.

Ensuring Purity of the Atmosphere.

The means of heating has an important bearing on the purity of the atmosphere in the apartment. Proper ventilation ensures the changing of the air sufficiently often to remove the impurities that get mixed with it, and chiefly the carbonic acid. This gas is one of the two ultimate results of the combustion of coal gas; the other being water. There is an impression in the minds of a number of people that carbonic acid gas (CO_2) is a poison, possibly through confusing it with carbonic oxide (CO), which is a poisonous gas; even less than 1 per cent. of it in the air being fatal to human life, by combining with the hæmoglobin in the blood, so as to interfere with its carrying oxygen from the lungs throughout the capillaries. Carbonic acid gas, on the other hand, is not a poison. It is not only the result of gaseous combustion, but is also given off by the lungs from combustion of tissue in the human bed.

It has been proved by many experiments (notably those of Dr. Angus Smith and others) that carbonic acid gas is not in itself harmful to life except in quantities far larger than are ever found in the air of ordinary rooms. As much as 229 parts per 10,000 may be present in an apartment without seriously interfering with the health of the occupants. Benedict and Milner quite recently, in an investigation on the metabolism of matter and energy in the human body (U.S. Board of Agriculture reports), have established that a subject in a respiration calorimeter can read, sleep, and eat meals with the normal regularity, and show no deviation from his usual physical and mental condition in an atmosphere containing 226 parts of CO_2 per 10,000. It is really not the CO_2 produced by gas combustion that causes discomfort, it is that which is exhaled by the inmates; and even then the harmful element is not the gas itself, but the organic matter breathed out with it.

As Dr. Whitelegge, C.B., H.M. Chief Inspector of the Factory Department of the Home Office, remarks in his work entitled "Public Hygiene:" "When carbonic acid is present in excess, it is to be regarded as indicating concomitant and injurious organic impurity, of which it is the harmless index." According to Pettenkofer, if the carbonic acid gas has been produced by human respiration, even a proportion of 10 parts in the 10,000 of air is highly injurious. Herr Weichardt also points out that gas-flames actually purify the atmosphere by burning up the toxic albuminous matter breathed into the air. Although it has been thought desirable to make clear these points in connection with the carbonic acid resulting from gas combustion, yet no one who employs good modern gas-fires need have any more than a theoretical interest in the matter, for all the products of combustion are entirely carried off by the flue in the best up-to-date fires.

From the subject of ventilation, it is an easy step to that which is known by the title of the "Smoke Abatement Question," which is really only outside ventilation. The great importance of this question is now being increasingly recognized, and with it the fact that if this question is to be solved in the near future, there will be no more important contribution to this end than that made by the use of gas as a fuel, and particularly as a heating agent, for there is no doubt that the domestic coal-fires in cities are more responsible for the smoke nuisance than even factory chimneys.

The Ideal Gas-Fire.

The ideal gas-fire for domestic use must give the highest possible percentage of its heat in the form of radiation, and what heat may be unavoidably given off by convection should be at as low a temperature as possible, instead of the high-temperature convection, which is the cause of all the discomfort in the less scientific types of gas-fire. Of the heat developed by the combustion, it has hitherto been found that a proportion somewhere about 25 per cent. has had to be allowed to escape by the flue, so as to keep it sufficiently warm to maintain the draught needful for carrying away the products of combustion and ventilating the apartment. It is of the utmost importance that the entire products of combustion be conveyed out of the room by the flue. An analysis of the air immediately above the canopy will show how often this vital hygienic point is overlooked.

Heating Large Apartments—Gas-Heated Radiators.

These remarks on gas-fires have been confined entirely to the heating of domestic apartments. Coming to the heating of larger apartments, or those having exceptionally favourable ventilating conditions, such as shops, bank premises, or similar public offices, the conditions are entirely changed, because, on the one hand, for obvious reasons, radiant heat would not be convenient, and, on the other, the objections to convected heat already named entirely cease to apply. For the heating of premises of this kind, convected heat, in some form or another, is always used, such as hot-water pipes, radiators, &c.; and the most usual application of gas in this connection is in the form of gas-heated radiators. These, of course, are without flues; and their use should therefore be confined to places where there is sufficiently frequent change of the air. The kind of gas-heated radiator most in use is that in which steam is generated within the radiator by the heat of the gas, and an automatic valve, controlled by the steam, is employed to cut down the gas (once the apparatus has reached a pre-arranged temperature) to a minimum sufficient to maintain the temperature. After not only prolonged laboratory experiment, but years of experience of the use of the various types of apparatus by the general public, the author has found that the employment of the medium of steam for actuating the automatic valve controlling the gas consumption in the radiator is the only accurate and reliable method in any kind of flueless radiator, and therefore also the only one that ensures perfect economy in the gas consumption.

In the particular apparatus of the kind of which the author has had much experience, the combustion is perfect (taking place outside the stove), and pure carbonic acid gas and water vapour are practically the whole products of combustion. These products, being warmer than the surrounding air, immediately ascend to the upper part of the room, where the carbonic acid gas either directly escapes by diffusion, owing to the porosity of the walls and ceiling, or else mingles with the air in the upper part of the room, and eventually escapes in the ordinary way without descending to the breathing level. Once the carbonic acid gas has mingled with the upper stratum of air, the mixture continues a perfect one. It has to be borne in mind that the porosity of the walls and ceilings is such that the gases diffuse through them with very great rapidity; the force of diffusion being aided by the force of capillarity. The gas-flame of the radiator has the valuable hygienic advantage not only of killing a number of the micro-organisms that may be in the air, but of burning up and destroying a considerable quantity of the organic matter exhaled by the occupants of the room.

Reference may be made here to the fact that it has been found that with the gas-steam radiator a room can be heated with less gas than is needed to light it. Taking a workroom 30 feet by 20 feet and 15 feet high, provided that no very close application to the work were needed, it would require six incandescent burners, each consuming 4 cubic feet of gas per hour, to light the room. If there were any bench-work or book-work to be done, for this size room it would require at the very least ten of these burners, consuming 40 cubic feet per hour. This room can be heated by means of two gas-steam radiators, consuming only 20 feet of gas per hour. It will thus be found that the amount of carbonic acid added by the radiators to the atmosphere of a room is extremely small, particularly in proportion to that produced by the means of lighting, or by the number of human beings ordinarily engaged in a workroom of the size named.

Flueless Gas-Radiators.

With a view to clearing up the position of flueless gas-radiators as regards their use in factories and workshops, and in order first of all to accumulate the necessary data to work upon, the author has had samples of air collected from various classes of apartments all over the country, where such apparatus are employed, and under all sorts of conditions. [See "Journal," Vol. CXII., p. 390.] Each person taking samples had to fill up and return with them a "Report Schedule," carefully drawn up so as to call for every particular of information—position, ventilation, weather conditions, nature of work, means of lighting, and so on—which could possibly modify the result in any way. Air samples were taken on two days, one with the radiators in use and one without, and these were returned to the works for analysis in the laboratories. The difference between the two days' analysis represents the effect of the radiators on the atmosphere of the room. Taking all the results thus obtained one with another, it has been found that generally the increase of carbonic acid gas when the radiators are in use is only about 5 parts per 10,000. In this way, a definite constant factor has been established for the contribution of carbonic acid by the gas-steam radiators, and when this 5 parts is added to the 3 to 5 parts per 10,000 which represent the normal proportion of carbonic acid gas in the atmosphere, the total is still well under the 12 parts per 10,000 put forward by the Departmental Committee as a safe maximum for factories and workshops; and seeing that the authorities allow for as much as 20 parts after dark, on account of gas and oil lighting, it seems that a corresponding allowance should be made for gas heating, which is so necessary and convenient for so many workshops. Against this there is the strong opposition of the authorities on account of the sulphur in gas; and it must be admitted that when the carbonic acid gas rises to the proportion of 20 parts in 10,000, there is something to be said for their contention, seeing that gas undertakings are not bound in any way—except with regard to the sulphuretted hydrogen—as to the quantity of sulphur they may send out in the gas. As the use of gas for heating workshops, &c., is on the increase, this is a point that gas undertakings should seriously consider.

Water-Heating by Gas.

In houses where the cooking is done by a coal-range, the domestic hot-water service throughout the house is supplied by the range boiler. The moment, therefore, that the householder arranges to substitute gas as a fuel in the household cooking arrangements, it is necessary to use gas for water-heating as well; and in this direction lies one of the most important applications of gas as a fuel.

There are in use for this purpose various systems, which may be roughly divided into three classes—viz., the class of apparatus known as instantaneous water-heaters, which are not generally connected to the various hot-water taps in the establishment, but are drawn from direct; and two types of apparatus intended for connecting to the hot-water supply system in the building, one class having a small boiler, and the water being caused to circulate between it and the separate storage-tank, and the other having the boiler and tank in one, and the source of heat directly under the tank. There are attaching to each method various advantages and disadvantages, of which the following is a brief summary.

Taking first the subsidiary boiler, or circulating apparatus, this

is usually a small copper or cast-iron arrangement which is connected to the existing hot-water pipe system and storage-tank. For a tank containing (say) 20 gallons of water, the small boiler would require to burn gas at the rate of 30 cubic feet per hour. At this rate, it will heat up the 20 gallons, till the return water from the tank to the boiler is at 150° Fahr., in from 2 to 2½ hours, with a consumption of 60 to 70 cubic feet of gas, depending, of course, on the length of pipe between boiler and tank, the calorific value of the gas, and other factors. In connection with the apparatus, it is usual to have a thermostat so arranged that at this point it will cut the gas down to a minimum sufficient to maintain the water at this temperature.

The advantages of this circulating type of apparatus are the small space it occupies, the ease with which it is connected to the existing system, and because as soon as ever the water begins to come hot from the boiler it can be drawn off from the tank, owing to the fact that it goes straight from the boiler to the top of the tank, and keeps its place there, consequent on the higher specific gravity of the cold water, until hotter water displaces it. Against these advantages must be set the disadvantage that all the water in the piping system between the tank and the boiler is continually circulating, and therefore continually losing heat in the same way as hot-water radiator apparatus, and this necessarily involves a continuous increased consumption of gas for which there is no return. It is a recognized practice with heating engineers that, no matter what may be the fuel employed with the heating apparatus, the considerable loss through this useless circulation must in general be avoided. Owing to this loss, it is necessary that the minimum of gas consumption to which the thermostat must be set to cut the gas down must be at least 10 cubic feet per hour, in order to maintain a temperature of 150° Fahr. at the return to the boiler in a system consisting of boiler, 20-gallon tank, and 17 feet of pipe. This minimum consumption can be reduced somewhat by lagging all the members of the system. A further disadvantage is that, to ensure the water in the tank being of the average temperature of 150° Fahr., it is necessary that the water should leave the small boiler at a much higher temperature; and as it is a well-known fact that directly water rises above the temperature of 150° Fahr. it begins to throw down a solid deposit, this is liable to be a very awkward matter, particularly where the apparatus has small interspaces, within which the water is so apt to cause choking-up by deposit.

[The author gave diagrams illustrating the working of two boilers of the type he had been describing.] One was constructed to burn at the start 85 cubic feet of gas per hour, which enabled the desired temperature to be reached rapidly; whereupon the thermostat coming into action reduced the gas to about 12 to 14 cubic feet per hour. The other boiler was of very different design; and while made to burn much less gas—viz., 30 cubic feet—at the start, reducing to 9 to 10 cubic feet, and therefore taking longer to heat up—it maintained a temperature in the storage-tank of approximately 155° Fahr. with 9·4 cubic feet of gas per hour. Owing to the better design, the water always left the primary heater at a higher temperature than that at which it entered it from the storage-tank.

In the other type of apparatus—the combined boiler and storage-tank type—the gas-burner is immediately under the tank, which is one with the boiler. There is therefore no loss of heat from the connecting-pipes between the boiler and the tank, or from the additional surface afforded by having the two separate. With this boiler, the water can be heated up to the required temperature in a very short time—for a 20-gallon boiler, 1¼ to 1½ hours—with a total consumption of about 50 to 60 cubic feet. When the required temperature (150° Fahr.) is reached, the thermostat will cut down the gas supply to the pre-arranged minimum. As regards this minimum, an hourly consumption of 5 cubic feet of gas will keep 20 gallons at 150° Fahr.; and this figure may be reduced by lagging the boiler to as low as (under the most favourable conditions) 2·2 cubic feet per hour.

Value of the Thermostat.

A most important feature of gas-heated water systems, and one to which the economy of such a system is due, is the gas-regulating device, or thermostat. The simplest form of thermostat, and one much in use in laboratories, &c., consists of a tube containing mercury. The expansion of this on heating cuts off the main gas supply. The mercury, however, comes into actual contact with the gas; and there are other obvious difficulties in applying such a device to an article designed for hard work. Many attempts have been made to obtain, with a more convenient medium, the results possible with a liquid of high expansion like mercury. These have generally taken the shape of capsules containing volatile spirit. The great majority of such thermostats are failures. Their commonest fault is that the medium used expands immediately the temperature starts to rise, and in doing so begins to cut down the gas supply at the same time. Instead, therefore, of allowing a large flow of gas until the water reaches the required temperature, and then cutting it down to just sufficient to maintain the temperature, these thermostats, by appreciably cutting down from the start, greatly prolong the heating-up period. Very often they are unable to cut down the gas to a satisfactory minimum after all; or if the apparatus be adjusted to do so, then, owing to the limited range of the thermostat, the maximum gas consumption is correspondingly reduced, with a proportionally increased time of heating-up. In testing many contrivances of this kind, the author has found that all those in which means had been taken to obviate the difficulty of the too early cutting-down still suffered from the further defect of a considerable delay in re-opening. The ideal thermostat would allow full gas to flow to the burner until the temperature was attained, and then cut down at once to the necessary minimum.

Capabilities of Gas-Heated Hot-Water Systems.

There is a great deal of misconception as to the capability of gas-heated hot-water systems to attain very high efficiencies—*i.e.*, to utilize a high percentage of the heat supplied to the boiler by the combustion of the gas. In practice, the rise in temperature of the water is noted, and the heat necessary to cause this rise calculated. This heat, expressed in British thermal units, is a certain percentage of the heat developed by the gas consumed; and this percentage represents the efficiency. It may be premised that it is quite possible to utilize from the burning gas all the heat of combustion. This is done on a small scale by all gas calorimeters; but they are specially designed for this sole object. The Boys calorimeter, for instance, requires a coil of copper pipe between 16 and 17 feet long, and surrounded by a helix of copper wire to ensure the whole of the heat being absorbed from only 4 to 5 cubic feet of gas per hour which it is arranged to deal with. The total heat having been absorbed, the uncondensed products, which are heavier than air, escape at atmospheric temperature—*i.e.*, they will not rise up a flue-pipe, an extreme point as regards the utilization of the heat, that is obviously impracticable in appliances which burn a sufficiently large amount of gas for every-day use, and for which a flue and a temperature sufficient to create a draught in it are therefore a necessity. Further, the water is merely heated in the calorimeter to 80° to 100° Fahr.—a temperature quite useless for a domestic supply service.

Now take the case of a separate boiler and storage-tank system. Some 30 feet of gas per hour have to be burned at the start when the water is cold. In view of the proportionally very large heating surface in the calorimeter, it is clear that it would be commercially impossible to provide the requisite surface in the boiler to ensure the transmission to the water of all the heat of combustion of the gas. Nor is this desirable, since it would entail the condensation of all the water of combustion—say, about 1¾ lbs. of water to 30 cubic feet of Birmingham gas—and would render the other products incapable of self-removal; these being at the same temperature as the air and heavier than the air, owing to the large proportion of carbonic acid gas they contain. As the water gets warmer, it becomes not only commercially but scientifically impossible in such an apparatus to transfer all the heat of combustion from the gas to the water; for the products of combustion must necessarily leave the boiler at a temperature not lower than that of the water, and so carry heat away with them.

There are three further points which help to limit the degree of efficiency to be attained with such a boiler. These are: (1) Coal gas contains a large proportion of hydrogen, and in combustion this is liberated and converted into steam. At first, and so long as the apparatus remains sufficiently cool, this steam will be condensed to water, and in the process of condensation it will, of course, give up its latent heat. But once the apparatus becomes too hot to allow of condensation, the steam escapes by the flue, and its latent heat is consequently lost. The heat lost in this way at the working temperature of the boiler amounts to 10 per cent. of the total heating value of Birmingham gas. (2) In several types of these small boilers, the flue temperature rises to well above 200° Fahr. Taking 240° Fahr. (which is certainly within the upper limit when the boiler is at its working temperature), the author has found that even a flue so exceptionally short as 2 feet will induce a draught of 300 cubic feet per hour at 240° Fahr. Reducing this to ordinary temperature, the corrected volume is 222 cubic feet per hour. Calculating the percentage composition of the flue gas from the amount of gas burnt, and multiplying these percentages by the respective specific heats of the components, it is found that such a current at such a temperature carries away with it some 760 to 800 B.Th.U. per hour out of a total of 16,500 B.Th.U. developed by the gas, or about 5 per cent. (3) There is a substantial loss by convection, and to a certain extent by conduction also, from the surface of the boiler, tanks, and connecting-pipes, as is proved by the fact that it requires 10 cubic feet of gas per hour to maintain the temperature of a separate boiler and tank system, as against 5 cubic feet with the combined boiler and storage-tank system. Starting from the previous definition of efficiency, the efficiency of any gas burnt merely to maintain temperature is *nil*, as it causes no rise in temperature. But the loss in the case of the separate boiler and tank system in this way is obviously 100 per cent. more than in the case of the combined boiler and tank system; and in the case of the boiler which burns 12 to 14 cubic feet, the percentage is, of course, 140 to 180.

There are other points which, if not carefully watched, are liable to lead to inaccuracy in statements as to the efficiency of such apparatus. For one thing, in using the thermometer to measure, by means of the rise in temperature of the water, the heat absorbed by it, the instrument will be naturally put in at the top of the tank. If one of these separate boiler and storage-tank appliances be used, the temperature at the top of a 20-gallon tank may be from 5° to to 20° Fahr. higher than the water at the bottom. In these circumstances, the only satisfactory way is to take the average of the temperature throughout the tank. A further point is that the capacity of the system should be very accurately ascertained, as "20-gallon" tanks do not always contain 20 gallons. The calorific value of the gas must also be determined at the time of the test.

It is not sufficient to publish tests, such as have been sometimes given, claiming high efficiencies, while calculating these from a reputed calorific value only.

From the foregoing figures, it is possible to get some idea of the relative magnitude of the various losses. When cut down and maintaining temperature only, the whole of the gas being consumed is lost from an efficiency point of view; and this is accounted for as follows:—

Ten Cubic Feet of Gas Burnt per Hour, when Cut Down by a Thermostat, and Maintaining only Working Temperature.

	Cubic Feet of Gas.
(1) Loss due to latent heat of steam = 10·5 per cent., accounting for	1·05
(2) Loss due to heat escaping in flue gases = 5 per cent., accounting for	0·50
(3) Loss by convection from tank, boiler, and circulating pipes—*i.e.*, balance after deducting (1) and (2) from 100 = 84·5 per cent., accounting for	8·45
Total	10·00

Of these three losses, (1) and (2) are dependent for their magnitude on the amount of gas burnt; while (3) is independent of gas burnt, but depends on the area of the whole system and the temperature to which it has attained. Considering the system at its working temperature, and just before the gas has been cut down, then 30 cubic feet of gas burnt per hour—

	Cubic Feet of Gas.
(1) Becomes 10·5 per cent. on 30 cub. ft., accounting for	3·15 lost.
(2) ,, 5 ,, ,, ,,	1·50 ,,
(3) Remains unaltered, accounting for	8·45 ,,
Total	13·10 lost.

There is therefore a total loss at this temperature of 13·1 cubic feet of gas out of 30 cubic feet consumed, or 43·7 per cent. It must be remembered that the conditions in respect of which this figure is calculated obtain only for a short time just before the gas is cut down; and therefore this figure is on the high side. It is, however, not so much so as might be thought; for of a number of actual efficiencies taken with this separate boiler and storage-tank system, over a range of temperature extending from 60° to 150° Fahr., the highest figure yet obtained by the author is 59·6 per cent. efficiency or heat utilized, which means 40·4 per cent. lost. And it has to be borne in mind that this range of 60° to 150° Fahr. is a maximum range, over which, obviously, the loss would be somewhat lower than that over the higher and more restricted range which would actually obtain in continuous practice. So that in practice the loss would generally be more than 40·4 per cent., and would lie somewhere between this figure and 43·7 per cent.

The case of such a boiler has been considered purposely when at its working temperature, which prevails for the greater part of its time. It may be that the statements of efficiency alluded to are based on tests taken over a period extending from the start—*i.e.*, from cold until a temperature of 150° Fahr. has been reached; and, moreover, that such efficiencies are calculated on the basis of the net calorific value of the gas. Apart, however, from the fact that heating-up periods of such compass are, where the apparatus is continuously at work, comparatively rare, it is evident that, as the water is always condensed during such a period, part of the difference between gross and net calorific values is being utilized in the apparatus. It is therefore misleading to calculate efficiencies on the net calorific value without this being plainly stated. In testing four or five different makes of boilers of this separate boiler and storage-tank type, and even calculating efficiencies in this illusory manner, the highest figure attained by the author with any of them has been 66·75 per cent.; and working it on the more correct basis of the gross calorific value of the gas, the highest figure would only be 59·6 per cent.

It is clearly, then, a matter of considerable difficulty to get a high percentage efficiency with this "separate boiler and storage-tank" class of apparatus; but, in spite of these facts, one sees makers of such gas-heated water apparatus confidently claiming percentages of efficiency well up in the nineties!

Gas-Heating in Manufacture and Handicrafts.

Among the most important of the present uses of gas as a fuel, and one which has an enormous future before it, in a great and increasing variety of ways, is the employment of gas-heated apparatus in various departments of manufacture and craftmanship. Probably very few realize the wide use of gas for commercial and industrial purposes which is going on to-day, and still fewer the almost incredible number of purposes to which it is capable of being applied with marked advantage over solid fuels. As regards gas authorities, there is no more promising opening for the disposal of their output of gas than this; and to manufacturers it offers opportunities of raising the standard of quality of their goods, and increasing the possibilities of their manufacture in economy, uniformity, and time-saving such as no progressive firm can afford to overlook. [The author cited the shipbuilding industry, engineering, jewellers' and silversmiths' work, die-sinking, safe-making, sugar-refining, &c.] Among the many advantages of gas-heated appliances in industrial use, not the least is the fact that they save as much in labour as they do in time. Not only is the process generally much quicker, but as the temperature is constant, the material can be placed in the furnace or muffle and left there for the exact period necessary, without stoking and without attention. What the furnace will do to-day it will do in exactly the same time to-morrow, at the same temperature, with absolute uniformity, certainty, and speed; and spoiled work by improper heats cannot occur. Armed with such advantages, a maker can turn out goods of a better class of workmanship than was possible with solid fuels; and metals, for example, will stand much more working than when treated by the old solid-fuel processes. If this important and invaluable use of gas is to go on developing as it ought, gas undertakings in general will have seriously to consider the wisdom of following the example already set by some (in cases where very large consumptions are involved) of offering gas to such users at a specially low rate.

But although gas-heated appliances have been in general use for so considerable a time, it is not suggested that the apparatus in use is all perfect, or that manufacturers of such apparatus are all so well informed on the principles underlying it as they ought to be. [The author gave a diagram showing what can be done with the muffle-furnace in the shape of an improvement lately effected on the normal type of furnace in general use.]

Value of High-Pressure Gas.

In nearly all furnaces, it is possible, by slight constructional alteration, to use low-pressure gas with natural draught; low-pressure gas with high-pressure air as a blast; and—latest development of all—by the use of high-pressure gas alone. The advantages of the latter system promise to be considerable. In various papers published during the last few months, results have been given showing a very great saving by the use of high-pressure gas. The chief points of advantage are the uniformity of temperature attained all over the heated space; the ease with which, after once for all adjusting the pressure, a given temperature can time after time be reproduced; the fact that the atmosphere of the furnace can at will be made a reducing or an oxidizing one; and —last, but not least—the extent to which the increased efficiency permits of the consumption being reduced. With high-pressure gas, it is not advisable to rely on the ordinary tap for regulating the flow. An adjustable nipple which allows of complete regulation, without decrease in pressure, is desirable.

Apart from the foregoing remarks with special reference to high-pressure gas, all that has been given in the paper with regard to the advantages of gas-heated furnaces generally applies with added emphasis where high-pressure gas is employed; and doubtless there is every indication that a great future lies before this particular method of employing gas as a fuel.

Gas for Motive Power.

Any mention of coal gas as a fuel would be incomplete without reference to the gas-engine. This particular use of coal gas is, however, a matter entirely by itself, and only passing reference can be made to it. Within the last few years, vast strides have been made in the economy and efficiency of these engines, and a great advance has been made from the indicated efficiency of 4 per cent. shown by the Lenoir and Hugon engine of fifty years ago. Since 1882, the indicated thermal efficiency of the four-cycle engine has gone up from 16 to 37 per cent., which, according to Mr. Dugald Clerk, is not very far from the highest thermal efficiency possible with such an engine. The direction in which progress is being hoped for is in that of the gas-turbine; but, though much effort has been put forward, it has so far been without practical result. Perhaps the writer of a paper on "Coal Gas as a Fuel" ten years hence will have more to say on this question, though according to the authority named, on theoretical grounds it is hardly possible to hope for a gas-turbine of greater practical efficiency than 22 per cent.

Concluding Remarks.

In conclusion, wide and important as is the field of operations which gas as a fuel already occupies, there are abundant indications that it is not only fitted, but destined, to cover, in the not distant future, a territory immeasurably greater still.

Discussion.

The President (Mr. Edward Allen) in moving a vote of thanks to the author of the paper, referred to the high position occupied by Mr. Yates in the gas industry. In addition to his long experience in the manufacture of gas appliances, he had given special attention to the science underlying the use of gas as fuel. He (Mr. Allen) had recently had the opportunity of going through Mr. Yates's works at Birmingham, and of inspecting the laboratories and testing-rooms which had been established there; and he had been astonished at the engineering skill shown in every department. The paper was full of valuable information, and, as engineers, they were glad to know that the efficiency of coal gas as a fuel had been so greatly increased by the scientific construction of appliances. He would pass over the question of those used for domestic purposes, although this was undoubtedly an important part of the subject. But one could not help being very much struck by the great strides that had been made within the last year or two in the use of gas by manufacturers. Reference had been made to furnaces 60 feet long. He had seen one or two under construction measuring 30 feet in length. Of course, they were huge things; and it was astonishing to hear from the users how valuable they were. In Liverpool, there was not the demand for this particular form of furnace; but in Birmingham, Sheffield, and many other large manufacturing towns, coal gas was being used

very largely for industrial purposes. He agreed with Mr. Yates in regard to the great value of recording pyrometers. By their means it was possible to obtain the best conditions for the manufacture of the gas; whereas in the old days it was necessary to depend on a man's eyesight, and accurate work such as was obtained to-day by the use of these scientific instruments was impossible.

Professor W. H. Watkinson thought the subject before the meeting was a very much neglected one, and the papers on it had been far too few. The author had referred to high-pressure gas and high-pressure air; but he had not mentioned the reason why high-pressure gas might be, and was, an advantage in certain cases. So far as he (the speaker) could understand, it was entirely due to the more rapid mixing that was obtainable when the gas issued at a high pressure. The combustion took place at normal atmospheric pressure. He considered this was a point of great importance. With reference to the curves of temperature variations, &c., which were given in the paper, it might have been helpful to many present whose knowledge of the apparatus and appliances was limited if some illustration could have been given of those in connection with which the observations had been made. Reference had been made to a flue 2 feet long inducing a draught of about 300 cubic feet per hour; but this was not sufficient information to enable one to judge, unless the area of the flue were also given. A great deal might be said in regard to the last portion of the paper, dealing with the question of gas-turbines. While it was the case that at present it was not known how to realize the efficiency of this machine, he believed there were great possibilities in the near future. A number of experimenters were engaged on the subject, and were obtaining results which would prove of real service. With regard to the subject of gas-fires for domestic purposes, in the case of newly-erected houses and those owned by the occupiers nothing better could be desired than the admirable gas-fires referred to; but for the million who lived in houses already erected, fitted with coal-fire grates and ranges, the difficulty lay in the initial cost of the plant. While the cost of a gas-fire installation remained at £5, £6, or £7, it was bound to be a bar to the wholesale adoption of these appliances; and, from his study of the question, he was unable to understand why gas-fires should not be supplied by gas companies at 10s. or £1. If this could be done, where one gas-fire was now to be found in use there would be a thousand; and in this way the smoke nuisance would be obviated to a very great extent.

Mr. A. C. Auden, alluding to the depth of the grid of the Méker burner dealt with in the early part of the paper, asked if this had reference to the depth of the cone. He should like to ask the author if he could explain why gas log-fires, while exceedingly ornamental, were so inefficient as regards heating power. In the particular case he had in mind, there were seventy small flames; but the heating efficiency was very low indeed. He had tried a bunsen burner, then a gauze flame, and several other methods, but without effecting any improvement. He agreed with Professor Watkinson in regard to the question of gas-fires for domestic purposes. In Glasgow, a householder requiring a gas-stove had simply to apply to the Corporation Gas Department, and the whole of the work was done; the consumer simply being called upon to pay for the gas used.

Mr. L. H. Chase referred to the heavy cost of heating water by gas in Liverpool. Mr. Yates had stated that it was necessary that the minimum of gas consumption should be 10 cubic feet per hour. In Liverpool, this would work out at 18s. per month—practically the price of a ton of coal; and it seemed to him (the speaker) that the time was far distant when the use of coal would be discarded in favour of gas, unless the latter were supplied at a much cheaper rate.

Mr. T. Dawson Clothier, referring to the diagram in the paper showing the working of a cast-iron boiler, remarked that in the primary heater the temperature of what was shown as the outlet was less than that of what was marked as the inlet. He understood Mr. Yates to say that the heater was acting as a cooler; and he took it that when the 10 cubic feet of gas were being used the primary heater was working in a reverse direction, and what was the outlet then became the inlet.

Mr. J. Tennant inquired how the increased efficiency of the muffle furnace as compared with the ordinary furnace was arrived at. Was it due to the lining of the muffle itself or to some internal construction?

Mr. Yates, in reply, expressed his thanks to the President for his flattering remarks. Referring to Professor Watkinson's observations, he said that the question of bringing along a few furnaces and boilers had occurred to him. They were, however, very heavy and bulky; and, further, he would have required to show competitive goods. He had endeavoured to deal with the subject in a general and an impartial manner, and therefore had not referred to any particular make of appliance more fully than was necessary. The question of the cost of fixing gas-fires was one with which, perhaps, he ought not here to attempt to deal. With regard to Mr. Auden's question as to the depth of the grid in the Méker burner, he had one of the burners with him, and it might be examined after the meeting. The grid would be found to be $\frac{7}{16}$ inch deep, and had a large area, allowing a high degree of aeration in the flame and so causing a higher temperature while the inner cone was reduced in size. With reference to gas log-fires, the idea had, he thought, originated in America, to give the appearance of an ordinary log-fire. The real reason of their low heating efficiency was that there was very incomplete combustion of the gas. They were possibly very pretty; but the bright appearance obtained with modern refractory materials was absent. Coming to the remarks of Mr. Chase, as to 10 cubic feet of gas per hour always being required, it was stated in the paper that, in some of the more efficient apparatus referred to, the hourly consumption could be reduced to as low as 2·2 cubic feet, which was sufficient to maintain the water at the required temperature. Regarding Mr. Clothier's remarks in connection with the primary heater, it was somewhat difficult to explain the matter clearly in the absence of the apparatus. They must imagine a boiler composed of two separate parts, one of which received the direct impact of the flame, while the other was heated by the waste products of combustion. When the gas was full on, both parts of the boiler delivered hotter water than they received. When, however, the gas was cut down to the minimum, the primary heater (*i.e.*, the one heated by the waste heat) delivered water colder than it received, because the loss of heat from its outside surface was greater than the heat supplied to it from the gases. There was reversal of the direction of flow.

Mr. Clothier asked how the temperature could be maintained in the receiver if the water were coming back from the top tank into the primary heater and the upper tank were supplying the lower one with hot water, and why the whole body of the water did not drop in temperature.

Mr. Yates replied that the whole system was not gradually cooled because the heat received at the secondary heater more than balanced that lost at the primary heater.

Professor Watkinson remarked that the matter was very difficult of explanation in the absence of an illustration of the apparatus. He thought he could understand why it was that, though the lower heater was receiving the impact of the gases at the higher temperature, the upper one might act as a cooler. In other words, the gases leaving the lower heater would always be at about 150° Fahr. unless there was some admixture of air; and it was this admixture of air that caused the cooling.

Mr. Yates said he would include a sketch of the apparatus when the paper was finally printed. In reply to Mr. Tennant's question, the increased efficiency of the muffle-furnace was due entirely to the design and construction of the muffle and burner.

Illuminating Engineering Society.—The next meeting will be held on Thursday at the Society of Arts (John Street, Adelphi, W.C.), at 8 p.m., when a discussion on the subject of "School Lighting" will take place. The discussion will be opened by two papers on the subject by Dr. J. Kerr (Medical Officer to the London County Council) and Dr. N. Bishop Harman; and co-operation by medical officers of schools and others interested in the subject has been invited. The chair will be taken by the President, Professor S. P. Thompson, D.Sc., F.R.S.

Society of Engineers.—The Council of the Society announce that the Status Prize may be awarded by them each year for the next three years, ending 1913, if papers of sufficient merit are received, for the best paper written by any person on the subject of "How to Improve the Status of Engineers and Engineering, with Special Reference to Consulting Engineers." In the present year, the prize will consist of books and [or] instruments, selected by the author of the premiated essay, to the value of six guineas. Essays sent in for competition must be received at the offices of the Society, 17, Victoria Street, Westminster, S.W., on or before the 31st of May in each year.

Reinforced Concrete Arches.—At the students' meeting held at the Institution of Civil Engineers last month, Mr. G. F. Walton read a paper entitled "The Design and Construction of Reinforced Concrete Arches." He described, with the aid of diagrams, the elastic theory for the computations of stresses in arches; and a comparative table showed that the strongest form of arch is continuous for abutments to crown, and further that the strength of the arch decreases with the introduction of hinges at the crown or springings—each additional hinge decreasing the carrying capacity of the bridge. The paper concluded with a description of some recently constructed arches of large span. The communication evoked a good discussion.

Coke Breeze in Concrete.—In the course of a paper on general concrete practice, read at a recent meeting of the Concrete Institute, Mr. T. C. Potter referred to coke breeze as an aggregate. He said it was extensively used for many years, principally for floors, but undeservedly lost its character some time since through a letter in "The Times," telling of its failure in Germany, where it had been prohibited. It was not stated of what class of coal it formed the residue; and this was an important point. So far as its strength was concerned, Mr. Kirkaldy made experiments for the West Ham Corporation some years ago, with the following result: A brick pier 18 inches square and 18 inches high, made with best stock bricks and blue lias lime mortar, crushed at the end of two years with 46 tons per square foot, whereas another pier, made of six parts of coke breeze to one part of portland cement, crushed with 131 tons. As to inflammability—one of the objections raised to coke-breeze concrete—the tests made by the Fire Prevention Committee with various kinds of floors, each under similar conditions, exposed for three hours to an increasing and ultimate temperature of 1900° Fahr., and water played on them from a hose-pipe, gave the following results: Coke breeze and burnt ballast, equal and best. Each was found, after being allowed to cool, practically free from cracks or deflection. Thames ballast and granite chips were the worst.

PRACTICAL HINTS ON RETORT-SETTINGS AND APPLIANCES CONNECTED THEREWITH.

By T. Brooke, of Birmingham.

[A Paper read before the Midland Junior Gas Engineering Association, Feb. 11.]

I trust that members will recognize that this paper is a collection of hints, and not a treatise. I propose to set forth opinions formed from experience, leaving current literature severely alone; and I hope that members with similar experience will corroborate my statements, and that those with contrary experience will make known their conclusions for my benefit, and that of the Association. For convenience, I propose to dispense with the conventional terms "writer" and "author."

Foundations.

Good foundations are essential. Mistakes here are often extremely costly and troublesome. Unfortunately, however, the ground is so variable in its structure, and the stresses due to the expansion of the retort-bench so uncertain, that no definite rules can be formulated for the strength of concrete necessary. Whoever decides this factor has to make a shrewd guess, guided by his previous experience, being careful to err on the side of safety. Before guessing, he will, if wise, have trial holes or borings made in several places, to ascertain the nature of the substrata. Even after doing this, it is still a guess, and often wide of the mark.

I have a case in mind where the foundations were to be laid for twelve beds of through retorts, with stage-floors, and stoking machinery. Borings were duly made, and revealed good firm ground, except about 12 feet below the surface. Here was found a thin vein, of a mossy nature, varying in thickness from 12 inches at one end of the site to 3 inches at the other. The engineer did not think it necessary to get a footing below this, and decided to put in 3 feet of good concrete. No sooner was the plant put to work, than settlement commenced. The concrete did not crack, but sank 4⅜ inches at one end more than at the other. All the hydraulic mains were worked from one tar-tower. There were no weir-valves on these mains to enable the seals of each to be adjusted separately. This meant a difference of 4⅜ inches in seal, along the house. All the hydraulic mains had to be levelled-up, and packing-pieces put in the flange joints between the ascension-pipes and arch-pipes. The tar-tower did not sink, with the result that the tar-main had a fall the wrong way. This had to be altered, as had also the weir-valve on the tar-tower. Before these alterations could be carried out, however, the hydraulic mains and tar-main became blocked up solid, owing to the tar not being able to get freely away. The retort-house walls did not sink, and so the floors developed a very decided twist, which seriously hampered the working of the charging and discharging machines. From this experience, I formed the following conclusions.

1.—Each bed should have its own separate hydraulic main and weir-valve.

2.—Not more than two of these hydraulics should be connected together in one length. This facilitates levelling of the mains. When a long main becomes twisted, it is extremely difficult to rectify.

3.—Not more than three or four beds should be worked by one tar-tower. Among many other advantages, this enables a good fall to be given to the tar-main, which fall should not be less than 2 inches per bed.

4.—It is useful to have a valve on the tar-main, at the inlet to the tar-tower. In case of an accident with the latter, as, for example, when the sludge-cock sticks wide open, the hydraulic mains can be quickly isolated, before any serious damage is done.

5.—Steam is very useful in clearing mains choked with very stiff tar, provided you clear the tar-tower first and work back, a little at a time, up the tar-main, to the hydraulics. This method enabled us to clear the tar-main, and four hydraulic mains, thoroughly in about a day. If not carefully used, however, pitching-up of the mains will be the result.

6.—Cleaning doors, as sketched (fig. 1), are extremely useful in hydraulic mains.

7.—Unless you have had considerable experience in foundations, throw the burden on the contractor, if he will have it. It is every day work with him. He knows the risks, and he usually prefers to leave this part of the work to the engineer, simply specifying that the concrete must be put in so as to suit the nature of the ground.

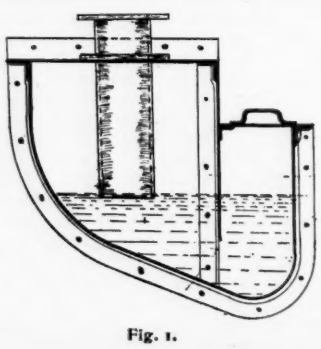


Fig. 1.

8.—The bench concrete should be a separate block, not connected to either the foundations of the chimney or the retort-house wall. There is then no danger of throwing the latter structures out of plumb by settlement of the bench concrete.

A few other conclusions, drawn chiefly from failures elsewhere are—

1.—The buckstays should be supported by an extra depth of concrete.

2.—The foundations should be wider opposite the buckstays, to prevent splitting.

3.—Lime concrete is very liable to crack, if laid during frosty weather. If used it should be protected.

4.—Lime concrete is apt to swell considerably when setting. It should be laid in layers of (say) 12 inches thick, and not brought up full height, till the bulk has properly set.

5.—Lime concrete requires much longer to set than cement concrete. The former should not be built upon for at least fourteen days.

6.—Cement concrete is much stronger than lime concrete when mixed in similar proportions, and is usually cheaper, strength for strength, than the latter.

7.—No cement should be used which has become damp and caked.

8.—Cement concrete should be pulled out, if not set in 24 hours.

9.—About 1 ft. 6 in. of good cement concrete is sufficient, in firm ground, for the usual stamp of horizontal deep regenerator installations; while 3 feet is ample for all except very bad ground. In the latter case, it can be considerably strengthened by putting in a couple of layers of expanded metal—one (say) 6 inches from the bottom, and another 6 inches higher up. All the sheets of expanded metal should overlap to the extent of about 6 inches.

Stage Floors.

The main floor joists should be perfectly free to expand at one end at least. The same applies to any joists connecting the bench bracing with the retort-house walls. Obvious as this precaution may seem, it is very often overlooked. Three cases stand out clearly in my mind, where much damage was done by neglecting to make such a provision. In the first case, a substantial stone retort-house wall was split along its whole length, about 2 ft. 6 in. above the cellar floor, and the top of the wall pushed 3 inches out of plumb. In the second, the gable ends of a new retort-house developed yawning cracks from top to bottom. In the third case, the house was built on cast-iron columns, practically every one of which was broken. The floor itself should, of course, have the same freedom for expansion as the floor joists. In my opinion, the best place to make provision for this expansion is against the retort-bench, as this gives more freedom of movement to the bench without straining the floors.

A good substantial stage-floor can be made of steel troughing filled in with cement concrete and covered with one course of red brick. In cases where the coke has to be quenched underneath the floor, it has, however, the great disadvantage that the water vapour and sulphurous fumes produced hang about under the floor, and eat away the steel. In such cases, I should prefer a floor of reinforced concrete.

Cellars or Subways.

Owing chiefly to the expense of elevating the coal for hand-charging in small works, the producers and regenerators are usually put below ground. This is often also done to avoid the cost of raising the retort-house roof. The foundations of such a bench are frequently laid below the water-line in the surrounding ground—a procedure which should never be followed without carefully considering the risks. Even if the bench is built in a concrete tank well puddled behind, it very frequently happens that such an envelope develops considerable leakage, and pumping has to be resorted to. It is here that the danger begins. The objection to pumping is not so much the cost of apparatus and labour, as the damage done to the foundations. The constant draining of the water to the sump hole undermines the concrete; and the engineer has always the feeling that serious settlement may occur at any moment. Then there is the danger of the pump failing, and putting out all the fires. I know of a case, in the North of England, where the pulsometer failed during the night; and before morning the subway filled within a few inches of the charging floor. It is therefore advisable, even at a little extra cost, to keep the top of the foundations above the water-line.

The ventilation of most subways is, in my experience, entirely inadequate. The provision for the outlet of the steam produced when clinkering is usually far from perfect; and in a large proportion of subways there are no arrangements whatsoever to admit cold fresh air to the bottom of the subway. The fireman's task is then not an enviable one. A great improvement can be made, in most cases, by using a Scott's movable platform, as shown in fig. 2. This is easily propelled from bed to bed by hand; and the endless rope forms a continuous fence for the part of the subway that is not covered by the platform.

Chimneys.

The chimney is sometimes built in the end walls of the bench. Personally, I am opposed to this, for the following reasons:

1.—It is necessarily flat, especially in the case of a long range, and so prevents the end buckstays on each side of it being as close together as they should be. It is therefore almost impossible to prevent the bench cracking from end to end. I have seen a substantial new bench badly cracked in

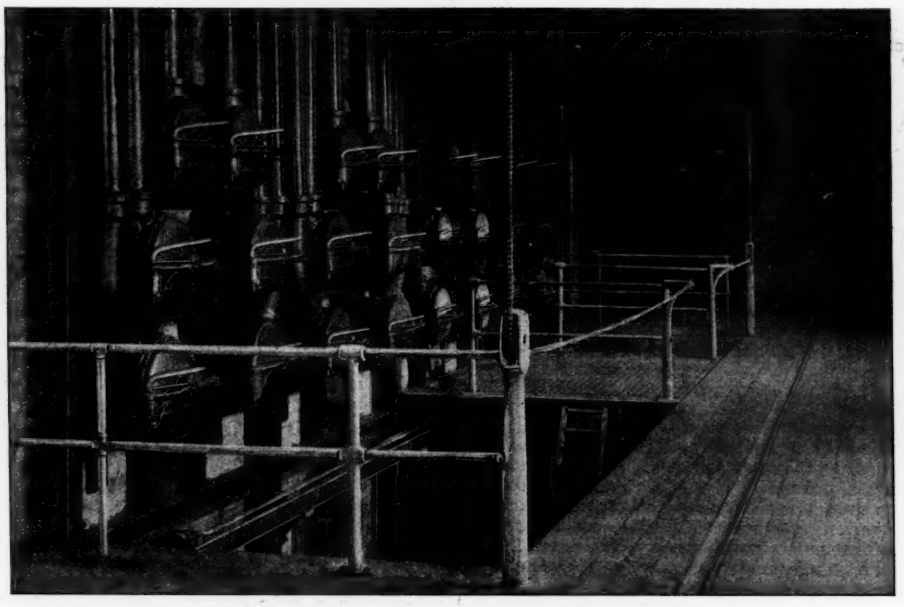


Fig. 2.—Scott's Movable Retort-Bench Platform.

this way. It was found necessary to strongly brace the end buckstays together, to prevent further damage.

2.—The expansion of the bench cracks the chimney, which needs securely bracing from top to bottom.

3.—The chimney is too flat to be very stable.

4.—The bench expansion may throw the chimney out of plumb.

The area of the chimney, main flue, or waste-gas flue, should be at least 1½ square inches per lineal foot of retort to be heated. Some contractors allow 1 square foot of chimney area per through bed of retorts; but I think think this is insufficient.

The height of the chimney need not be more than 70 feet for regenerator settings. It should, however, rise well above the apex of the retort-house roof, or of any roof at all close at hand. Otherwise the direction of the wind will seriously interfere with the pull.

It is advisable to build a cleaning door in the bottom of the chimney, as flue dust usually accumulates here. This door is also useful in starting up the beds. A fire can then be put in to "dry out the cold core"—an operation which is often essential before a chimney can be made to work.

Main Flue.

Where it can conveniently be avoided, the main flue should not be on the top of the bench. It should run immediately behind the furnaces—*i.e.*, in through beds, along the centre line of the bench. The advantages of this position are—

1.—There are no inaccessible uptakes, which are liable to choke with flue-dust.

2.—There is no danger of anyone falling through a faulty cover into the flue. I have seen two bad accidents of this description.

3.—Saving in brickwork.

4.—Saving in radiation of heat.

5.—Saving in height of ascension-pipes and front and back buckstays.

With direct-fired settings, it is almost impossible to avoid having the flue on top, without much extra cost in excavation, foundations, &c.

With through or back-to-back beds, there should be a midfeather dividing the flue into two halves longitudinally, with a damper to each half at the entrance to the chimney. This very much facilitates the regulation of the settings to suit the direction of the wind. The midfeather need not be more than 4½ inches thick, provided it is firmly built.

The inlets to the main flue should be cut at an angle towards the chimney, to prevent the baffling of the gases. Care should be taken not to seriously diminish the inlet-flues in doing so.

The main flue should be paved with a couple of courses of fire-brick, to preserve the concrete.

Pier Walls.

The pier walls should not be less than 18 inches thick, and built of solid fire-brick. A poorer class of fire-brick may be used for the portions below the setting; but, above this, the material should be of the best quality. Old English bond is as good as any for this work. There is no very serious objection to building these walls with four courses of stretchers to one course of headers, provided that the work is made solid. If not carefully watched, however, many bricklayers will build up the four outside courses of stretchers, and wait their opportunity to fill in the 9-inch cavity with old bricks, broken bricks, &c., which they rapidly cover up with the heading course, ready for a fresh start. A wise clerk of works will frequently lift a few of the headers to inspect the filling. It is claimed for this method of building that it is practically all half-bond, and is therefore stronger, longitudinally, than "Old English," which is quarter bond throughout.

End Walls.

The end walls should be at least 2 ft. 3 in. thick in a bench of three or four beds of horizontals, and 3 feet in longer benches and inclines. Only the inside 9 inches need be of good fire-brick; the remainder being built of old bricks or of good red brick. If the latter cannot be worked in bond with the fire-brick, as is usually the case, they should be blocked in at frequent intervals. Segmental arches require thicker end walls or stronger end buckstays and tie-rods than semi-arches, as the horizontal thrust is greater.

Footings.

Seeing that the weight to be carried per square foot is much more in the case of the pier and end walls than in other parts of the bench, it is advisable to commence these with three or four courses of footings to distribute the weight more evenly over the foundations.

Main Arches.

Where possible, without seriously increasing the height of the bench, these should be semi-circular, as the thrust which they transmit to the end walls is much less than with segmental or elliptical arches. If the latter shapes are used—and these are almost universal where the retorts are set in three vertical tiers—the radius should not be more than about 7 ft. 6 in.

The inner fire-brick ring should be made 9 inches deep, not 4½ inches, as is commonly done. This 9-inch ring is usually built of 9 in. by 9 in. arch-blocks, with specials to form the reveals. I believe that quite as good a job can be made by using 9 in. by 4½ in. end arch-bricks, in place of the 9 in. by 9 in. blocks. This is much less costly. I have known cases where the inner 4½-inch ring of a semi-circular arch has given way after about two years' work.

The 9-inch ring should be covered by a 4½-inch course of fire-brick, and the spandrils be filled up with common bricks, or old fire-bricks, to a height of at least four courses above the top of the fire-brick work. If backing-up material is cheap, a few (say 3 or 4) extra courses on top are never wasted, as they considerably reduce the loss of heat by radiation, and no great care is needed in laying them.

In some parts it is (or was) a common practice to fill in the spandrils with sand, finishing off with a course of brickwork on top. This should never be permitted, because the sand finds its way through any cracks that may develop in the arch, choking up the setting and emptying the haunches. The arches are then weakened by having insufficient weight on them, and the loss by radiation is also increased.

The practice of building the tie-rods in the spandrils, or in the brickwork above the arches, should also be deprecated. On one occasion, I had to rebrace a bench where the tie-rods had been so built in. I found that nearly every rod had been completely burnt away in one portion or another.

I am not a great believer in the utility of air-spaces between the rings of the main arch. I believe the practice is dying out in this country. The claims advanced in favour of these spaces were—

1.—Saving in heat radiation, owing to the air being a bad conductor.

2.—Freedom for the inner ring of the main arch to expand and contract, without disturbing the brickwork above.

There may be something in the first claim; but I should prefer to trust to a little extra brickwork. As regards the latter claim, I

believe that the air-space tends to weaken the arch, instead of strengthening it, especially in the case of a semi-arch. There is so much horizontal thrust to be transmitted by the main arches that they must have plenty of weight above them to prevent them buckling. I am told that in America it is a common practice to build a series of tubes between the fire-brick rings; the tubes being closed at the ends. It is claimed that much heat is saved by them.

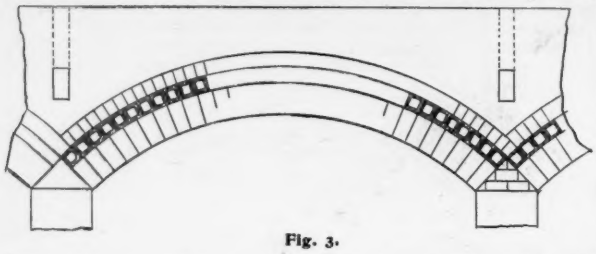


Fig. 3.

These tubes are shown in the sketch fig. 3. This sketch also illustrates a channel built in the spandril, with uptakes to facilitate the escape of steam during the drying process. If these are used, the uptakes should be afterwards blocked-up to avoid loss of heat. The sketch further shows how the springer blocks, indicated on the left, can often conveniently be replaced by ordinary bricks and feather-edges. This makes quite as good a job, and is much cheaper. The usual form of springer block, being very heavy, is costly to make, and rarely true to shape.

Building the Bench.

The buckstays and cross-joists should always be in position, before commencing to build the bench. This effects considerable saving in plumbing and scaffolding. The bricks are built close up to the stays, so that a much better fit is assured than could be obtained when the bench is built before the stays are fixed. If the buckstays are not put in first, it is necessary to leave the holes in the cross-joists to be drilled in position, because the bricklayer can rarely guarantee that his work will not be ¼-inch tight or slack. This all means extra labour. Moreover, it is never safe to slack the centres of the main arches until the end buckstays and tie-rods are in position, because the end walls, especially when green, would not be strong enough to withstand the overturning thrust of the arches without the aid of the buckstays.

In the case of deep settings, it is advisable to build in the regenerators and producers to about stage-floor level, before commencing to turn the main arches. This strengthens the walls considerably; and much labour can be saved in scaffolding when the regenerators are built up along with the pier walls.

All the arches in the range should be turned together; and the centres should not be slacked until the end buckstays and tie-rods are in position, and the spandrils have been filled in almost level with the top of the arches. No time should be wasted in doing this, after the arches are turned, as the latter should find their own bed before the clay has properly set. Semi-arches are more liable to buckle than segmental ones, if the spandrils are not previously filled in.

It is very important, especially in pier walls and main arches, that the bricks should be buttered all over, and not merely "tipped" at the edges. They should all be well hammered down; the joints not being in any case more than ⅛-inch thick. If the regenerators cannot be built before turning the arches, the pier walls should be well strutted, from end to end, at intervals of about 4 feet in height. Each row of strutts should be at the same height throughout the range, and should not be removed until necessary to do so in building the regenerator or setting. The outside 4½ inches of the bench and regenerators is best built with finely ground black mortar, as this withstands the action of water and the weather much better than fire-clay.

Direct-Fired Settings.

Before passing on to gaseous firing, I propose to say a few words about the much-disparaged direct-fired setting. I know that it is the custom of many engineers to recommend regenerators, even for the smallest gas-works. I am sure this is a mistake. In a small works, with little storage capacity, it is often necessary to light-up a bed and get it to work in a few hours. A direct-fired bed will meet this sudden demand much better than a regenerator. If the latter are used for emergency purposes, they must be kept constantly under slow fire; and, in this way, they often consume more fuel than they save when in action. Moreover, if the regenerator is to be more economical than the direct-fired setting, when in ordinary use, it must receive more skilled attention than is usually to be found on very small works.

For this class of work—and, in fact, for all retort-work except horizontals with stoking machinery—I believe segmental retorts are better than moulded ones, for the following reasons.

1.—They will withstand sudden starting and stopping better than the moulded ones. They can give way a little at each joint, instead of developing large yawning cracks. All the joints should be tongued and grooved (beaded and moulded). When rebated, they have a tendency to warp, and form an uneven surface.

2.—They are much more easy to repair, and complete retorts can be easily built in without disturbing the stay walls or the other retorts. Whole beds can be re-set without disturbing the ironwork.

I have found it a difficult matter to heat the back-end of single direct-fired settings, if the retorts are more than about 8 ft. 6 in. long. Many such settings are in action where the retorts are 10 feet long. The back-ends are then usually heated by adopting the single back chamber, the double back chamber, or some form of traversing setting. There are three great disadvantages to this class of setting.

1.—The flues are usually inaccessible in parts when at work; and therefore if they choke up they cannot be cleaned.

2.—Short-circuiting takes place between the flues, leaving portions of the setting inadequately heated.

3.—In a long traverse, the gases are much cooler on leaving the setting than on leaving the furnace. The retorts are therefore unevenly heated.

If the retorts are not more than 8 ft. 6 in. long, over all, the setting can be evenly and economically heated without any back chambers or intricate flues. The gases then simply rise up vertically from the furnace, and, passing over the top retorts, drop down between these and the pier walls into a common flue alongside each bottom retort. They then travel to the front of the setting and return, under the bottom retorts, into uptakes in the back wall of the setting, and thence past the dampers into the main flue. Every flue can then be cleaned out, where liable to choke, while the setting is at work. The furnace should be as long as can be conveniently worked, to facilitate the heating of the back-end of the retorts. The fire-bars should be kept about a foot below the bed of the bottom retorts, for the same reason. There should be a large grate area—say, 1 square foot for each single retort, with a little extra for small settings of three or four retorts. With a cramped furnace, the firemen are apt to get too deep a fuel-bed, in order to save the labour entailed by firing-up at frequent intervals.

In a comparatively large retort-house, with twelve through beds of direct-fired settings, I found the men feeding the fires every two hours—a custom which had been in vogue as long as the oldest hands could remember. The grates were very small; and, to enable the fires to last the two hours, they were filled up to a depth of about 2 feet. The amount of producer gas formed was enormous; and it could be seen blazing out at the top of the chimneys. This, of course, was a great waste of fuel. By simply getting the men to feed the fires once in 80 minutes, and never allowing the depth to exceed 12 inches, the temperatures in the retorts went up with a bound at least 100° Fahr., and, from the same coal, and with gas of equal candle power, the make per ton increased about 9 per cent. With a good grate area, the fires are kept more uniform, and require less damper. This means that there is not so much heat carried into the main flue, and the retorts are much more evenly heated. Moreover, the clinker is not nearly so troublesome as in the case of a cramped grate needing a big pull.

Seeing that stop-end retorts are most common with this type of setting, I would remark here that loose stops are to be preferred to solid-end retorts. It is practically impossible to burn the latter properly from the inside, in a kiln; and an inferior article is the result.

Generator Settings.

A generator setting is one which is heated by producer gas, formed in a generator or producer similar to those described later, under the head of "Regenerators." It differs from the latter type of setting inasmuch as the waste gases, after passing round the retorts, go directly to the main flue, instead of entering a regenerator or recuperator, where a large portion of the heat in the gases would be given up to the secondary air, and returned to the combustion chamber. Theoretically, the generator has no advantages in economy of fuel over the direct-fired setting with controllable air supply. Its real advantage lies in the better control of the heating of the retorts. The secondary air is often heated by passing up flues alongside the producer. There is, of course, no gain of heat in this, as the heat would otherwise be carried up to the combustion chamber by the producer gas.

Regenerative or Recuperative Settings.

These are too common to need a definition. I simply propose to call your attention to a few points which, in my opinion, are worth consideration in designing and working this class of setting

The Producer or Generator.

I propose to deal only with internal producers. The deciding factor in the choice between a shallow and a deep producer should be the nature of the coke to be used. In cases where good caking coals are used, there is not the least doubt that the deep producer, with (say) 5 feet of fuel, is much better than the shallow producer with about 2 feet or 2 ft. 6 in. of fuel. In many parts of Scotland, however, where splint coals and cannels are used, the coke or "char" is too small to be properly worked in a deep producer. It is therefore a sheer waste of money to instal the deep type.

A few years ago, in a certain works in Scotland, it was decided to build a long new range with deep producers, in preference to building shallow ones similar to those already in use. On starting up the plant, I found that the coke lay so close in the producer that the retorts could not be raised to anything like a proper temperature until I decided to work with shallow fires. This enabled me to get as much heat in the retorts as anyone could desire. Since then, the fire-bars have been raised about 2 feet. In another place near the Scottish border, I found some shallow producers working with about 2 feet of fuel. The heats were very poor. I

noticed that the coke was so uncommonly large that it only took about three layers of it to fill the fire up. When we broke the coke before using it, the heats were all that could be desired. A deep producer would have saved this trouble.

Shallow producers are often installed to economize initial cost or to prevent going below the water-level with the foundations, whether or not the coke requires a deep producer. For the purpose of increasing the depth of the fuel, the producer-arch is often omitted. This procedure has three great drawbacks, in addition to those already named.

1.—There are no means of distributing the producer gas over the length of the retorts. I have found, with long single retorts so set, that it is difficult to get the heat to the back of the setting.

2.—There is a tendency for the sides of the producer to cave in where the arch should be.

3.—The firemen are apt to robble the fire back too much, in order to keep a deep fuel bed; and there is therefore a danger of choking-up the secondary-air nostrils with coke.

Grate Area.

The grate area should be as large as possible, provided that it does not exceed about 1 square foot per 10 feet length of retort to be heated. If this limit is much exceeded, there is a danger that the flow of primary air through the fire will be so slow that there will not be a sufficiently high temperature to convert the carbonic acid formed in the lower parts of the producer into carbonic oxide. A short time ago I had experience with several beds where the producer nostrils were so choked that it was impossible to get sufficient pull on the top of the coke with the depth of fuel in use. The flow of primary air was then so slow that the same action took place as we might expect with too big a grate area. The coke in the furnaces was only a very dull red; and the producer gases showed about 8 per cent. of carbonic acid. By simply reducing the depth of fuel from about 7 feet to 3 or 4 feet, the fires livened up, good producer gas was formed, and the temperature of the retorts was raised from about 1650° to 1850° Fahr. in about 24 hours.

Provided that the grate area does not exceed this limit, there is much to be gained by building a large grate in preference to a small one. A few of these advantages are—

1.—More constant depth of fuel with the same period of firing. This means a more constant quality of producer gas, and therefore less waste than by having a great excess of producer gas at one time and of secondary air at another.

2.—More time-contact of primary air with coke, also resulting in better producer gas.

3.—Less formation of troublesome clinker.

4.—Less tendency for the primary air to cut channels in the fire or to slip up the sides of the furnace. In addition to forming better gas, this tends to increase the life of the producer lining.

5.—The vacuum in the setting will be reduced, thus ensuring more even heating, and less waste by heat carried away into the main flue.

Primary Air.

Personally, I prefer to admit the primary air through the clinkering-door. When admitted in the ordinary way through flues alongside the ashpan, there can be very little regenerative effect; and this is more than counterbalanced by the trouble and loss when the air-inlets get choked up with clinker or ashes, as they frequently do. It is often argued that the flues distribute the air more evenly under the fire-bars, and tend to prevent short-cutting up the front of the fire. I do not think there is much foundation for this contention. In any case, the fires should be well ashed-up with wet ashes in front, in order to counteract any tendency that the primary air may have to take a short cut this way. Even if the fires were not ashed-up, I still believe that there would be no more tendency for the air to go this way when admitted through the door than when admitted through ports in the side of the furnace. It is a great mistake to carry the air round to the back of the furnace, as is sometimes done. It is then almost impossible to clean the flues.

Fire-Bars.

These should always be of angle iron section resting in V-shaped grooves cast in heavy cast-iron fire-bar bearers. When deciding on the size and spacing of these, the size of the coke to be used should be carefully taken into account. Contractors are too apt to standardize the sizes of fire-bars and bearers without considering this most important factor. When the fire-bar bearers have once been fixed to suit (say) a large coke, where the bars should be a good distance apart, it is almost impossible to change them without letting down the bed. If the coke happens to be small, the ash-pan is continually being filled up with coke; and the fuel bill consequently goes up. The only way out of the difficulty is to set aside the fire-bars supplied and put in larger ones. This considerably reduces the grate area, and often makes it impossible to properly prick-up the fires.

The fire-bars should have a good slope towards the back, and should be cleaned by pushing down a light rod every time the fire is pricked-up. This facilitates the water cooling and preserves the bars. The front of the fire-bars should not be more than about a foot below the top of the clinkering door frame. It is then not much trouble to ash-up the space between the top of the bars and the frame. This distance should be sufficient to allow the clinkering spears to be placed high enough to cut off the clinker.

Clinkering Spears.

Clinkering spears are usually made of about 3 in. by $\frac{7}{8}$ in. or 3 in. by 1 in. mild steel. These very soon burn away, especially if the fire clinkers badly. It is better to make them of a light H section. They need not be any heavier than the ordinary spear; but they have the advantage that they can be water-cooled in the same way as the fire-bars. Their life is therefore much increased, and there is no danger of dropping the fire through the softening of the spears.

Ash-Pan.

The ash-pan should always be provided with an overflow, delivering into a gutter in front of the bench. To facilitate cleaning, it should be a perfectly straight pipe. The inner end should be near the bottom of the pan, otherwise a varying amount of primary air will be admitted through the pipe. Brick ash-pans, rendered with cement, are, I believe, more durable than cast-iron ones. The ash-pan should come as near to the front of the furnace as possible, and have a gentle slope, to facilitate ashing-out.

Water Supply.

The water supply should have: (1) A constant pressure (say) from an overhead tank; (2) wheel valves, and not plug valves, for regulation; (3) adequate provision for distributing the water equally on all the bars; and (4) easy access for cleaning purposes.

Clinkering Door.

The clinkering door should be substantially made, and a good fit. The faces should be kept clean, and the door should be protected from excessive heat by ashing-up above the fire-bars. This will prevent it from warping.

Shape of Producer.

The producer should be as square as possible, provided that there is sufficient grate area. It should have at least 1 ft. 6 in. of brickwork in front. The lining is best built of 9-inch bricks, all headers. A good lining may, however, be made of 6 in. by 6 in. by 1 ft. 6 in. blocks. Some engineers prefer to build a $4\frac{1}{2}$-inch loose lining, because it is much cheaper to renew than the 9-inch. There is danger that these $4\frac{1}{2}$-inch linings may collapse at a most inopportune moment; and this uncertainty more than outweighs any slight advantage in cost of upkeep. The furnace linings should not be tied into the regenerator proper, because the unequal expansion tends to cause short-circuiting between the producer and the regenerator. There is also a great danger of shaking out the joints in the regenerator when cutting out the lining.

There should be as few offsets as possible in the producer, as these tend to hang-up the clinker. This occurs chiefly just above the clinkering door. A special bent clinkering bar should be provided for removing it. I know a case where this clinker was allowed to accumulate to such an extent that it formed a solid bridge from the front to the back of the furnace, which took three men two days to remove. This, of course, is not liable to happen, except where excessive steam has raised the clinker zone above the reach of the spears.

The Charging Opening and Door.

As to the charging opening and door, this portion of the bed has completely spoilt many an otherwise good setting, and made many a bad one worse. The projecting producer lends itself best to quick and comfortable charging of the furnace, which is essential with stoking machinery, and of great importance with inclines. In these latter cases especially, the opening should be large (say, 1 ft. 6 in. diameter), with a good clear drop into the furnace, so arranged that the fire fills up as level as possible to avoid unnecessary robbling. It should be easily possible to level the coke right to the back of the furnace to the full depth of fuel required. Much time and labour are wasted, even in many modern gas-works, by neglect of the above precautions. Charging machines are delayed because the coke cannot be put into the furnace as quickly as they could push it out. Not only is time wasted, but the machine having to stop too long in the retort gets overheated, with a consequent reduction of life. In cases where they adopt the useful practice of putting extra pull on each section immediately that section is charged, in order to increase the make without seriously reducing the quality (which can easily be done by a system of retort-house governors), this prolonging of the draw means a considerable waste in gas. If the fire cannot be levelled to the back of the furnace, it will burn away quickly in that part, and it will be found impossible to make good producer gas, and therefore quite impossible to get good heats.

For these large openings, the plug door—*i.e.*, a door consisting of a cast-iron case lined with fire-brick—is too heavy and cumbersome to handle conveniently. A substantial cast-iron dished door which can be slipped on or off along a level cast-iron frame is most suitable here. For smaller furnaces, I prefer the round plug door with lid-lifter.

It would, no doubt, be a great advantage if the depth of the fuel-bed could be kept constant. Many attempts have been made to attain this end, and incidentally to prevent the admission of air, through the charging-door, to the underside of the producer-arch, by installing some form of curtain-wall. The idea is good in itself, but may lead to troublesome results in inexperienced hands, as the following incident will clearly show. A number of furnaces,

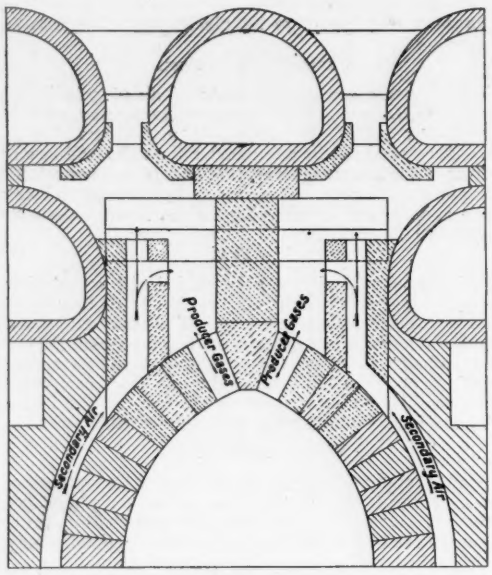


Fig. 4.

with curtain-walls, were installed in a certain gas-works. They gave every satisfaction for several years, until it became necessary to repair them. The manager decided that they would do this work themselves. He thought he could strengthen the arch supporting the curtain by making it 9 inches or 1 foot deeper. This was done; and when the beds were set to work again, no satisfactory heat could be obtained. I was sent to investigate, and discovered the alteration. I found that very little fire, if any, could reach the back of the furnace, owing to the curtain-wall being too low. We had to cut holes through the front of the producers and remove the lower portion of the arch, after which the beds worked quite satisfactorily.

In one large works in this country, a number of settings were installed; and, through faulty design, it was found impossible to get sufficient coke on the back of the fire-bars through the opening provided. Fresh doors were fixed underneath the stage-floor; and the furnaces are now being charged with cold coke through these new doors. Not very long ago, I discovered a similar draughtsman's error in time to have it rectified.

Producer-Arch.

The best and most common shape for a producer-arch is semi-circular. Fig. 4 shows a design made by the engineer of a certain works for the combustion chambers and producer-arch. This had many obvious faults; not the least of which is that the combustion-chamber would be inaccessible. Fig. 5 shows how the beds were actually erected; a compromise being made between the contractor's design and that of the engineer. These settings had only been at work a few weeks when the key-blocks in the producer-arch lifted, and the arches collapsed completely. Fig. 6 shows how these were rebuilt; and I might say that they have caused no trouble since, though they have had several years' work. There are ways in which this arch could be improved, but it was made to suit existing conditions.

The producer-arches should be built of 9-inch blocks made of

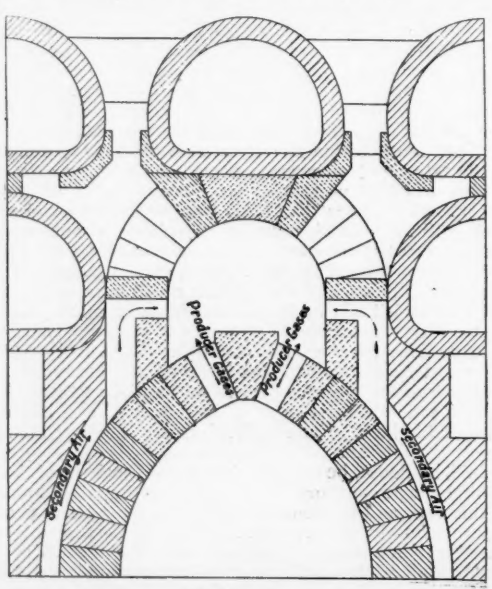


Fig. 5.

the best material. Personally, I prefer to build the lower courses of good fire-brick, and those which come in contact with the combustion chamber of the best silica. I have found Yorkshire silica to be very suitable for this purpose and combustion chamber work. I have never known the "S. P." brand of Yorkshire silica to fail; and I have seen others, guaranteed as good, completely flux over Yorkshire silica bricks built side by side with them—the Yorkshire silica remaining perfectly intact. Some engineers recommend the use of nothing but special fire-brick in the producer-arch, on the ground that silica will not withstand the sudden changes of temperature prevalent under the producer-arch caused by the opening and closing of the charging-door. They, moreover, argue that only the top of the fire-brick is exposed to the combustion chamber heat, and that this does not materially weaken the arch. I have seen such arches built, and noticed the top of the fire-brick arch flux and almost entirely choke-up some of the nostrils. It was then decided to cover the arch with a layer of Yorkshire silica—a procedure which, I think, should always be followed if the arch is built in fire-brick. When silica is used in producer-arches, the bricks should not be laid too tightly. A space of about an inch should be left for expansion at each end, and with through beds in the centre also.

The top of the producer-arch should be a foot or so beneath the bottom of the lowest retort. Fig. 7 shows a design which failed dismally, chiefly owing to the producer-arch being too high. The bottom retorts could not be got to a reasonable heat, even when the top retorts were excessively hot. The mistake was made in endeavouring to avoid having a projecting producer.

The first alteration was to cut away the silica alongside the bottom retorts, and to cut a few ports in the spot course between the bottoms and runners. Although this improved matters, it did not give satisfaction.

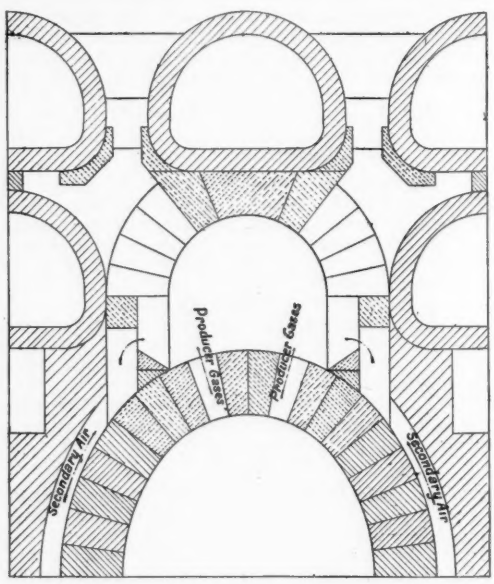


Fig. 6.

Fig. 8 shows how the design was altered and made to give excellent results so far as even heating of the retorts was concerned. The fuel was also reduced considerably, though an inefficient regenerator prevented this becoming exactly what it should be. There was some little trouble caused by the fire-brick in the producer-arch fluxing and filling up the secondary-air ports. These have now been raised a little, in order to prevent a recurrence of the trouble.

When these alterations were made, the combustion chamber arches were not lowered. The result was that the pressure on the bottom retorts caused the sides of the combustion-chamber to cave in.

For some years, it was the custom to graduate the producer nostrils and secondary-air ports, making them smaller towards the centre of the bed in through settings, or towards the back of a single setting. The idea was, of course, to obtain more even heating of the retorts. It is becoming recognized that it is impossible to do this with any degree of certainty, as sizes that suited one bed would not suit another, and, to do any good, some of the ports had to be ridiculously small. These were apt to choke up, and spoil the whole business. As an instance of the use of this method, I have seen very good even heats in a bed where, by accident, the holes were built larger towards the centre. The most certain way to obtain the even heating is, I think, to build the nostrils and air-ports of a uniform size, and regulate the heat to the various parts of the bed by means of special dampers, which must, of course, be well out of the heat zone, to prevent sticking. The producer-nostrils can then be cast in special arch-blocks, which need not be varied for each nostril. The nostrils should be wider at the bottom than at the top, to prevent blockages. This cannot be conveniently done when they are formed by ordinary arch-bricks. In the case of inclined settings, it is far better to

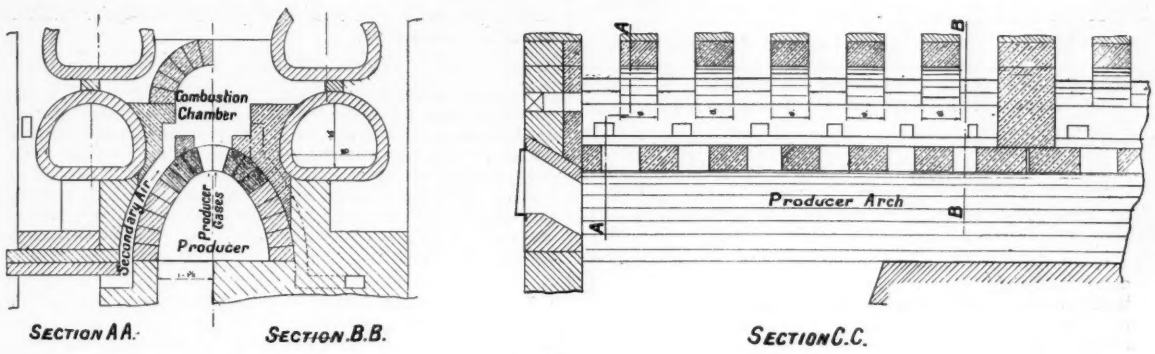


Fig. 7.

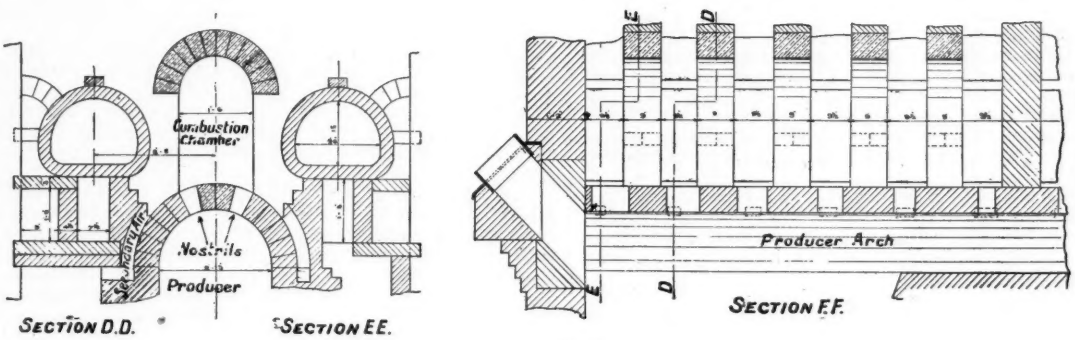


Fig. 8.

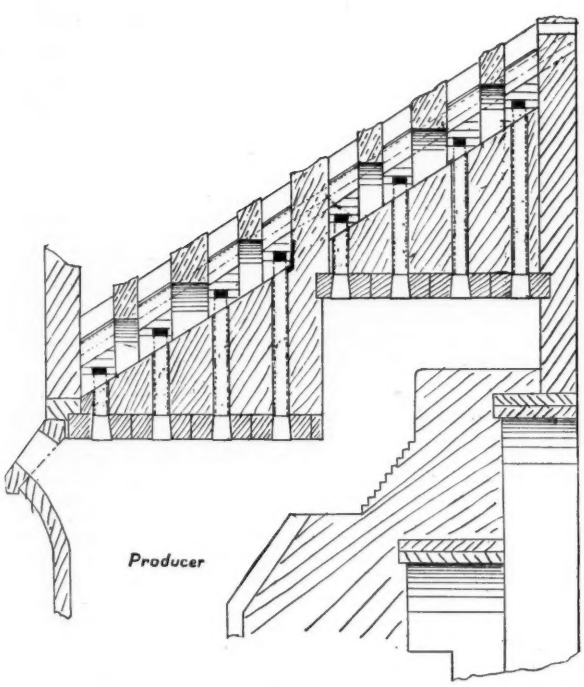


Fig. 9.

build the producer-arch on the slope than to build it horizontal, as shown in fig. 9. The latter method entails long inaccessible nostrils, which are a constant worry, especially if they are as small as some of those indicated on the sketch, which is from an actual working drawing. The longest of these nostrils are 6 ft. long by 6 in. by 2 in. section.

It is now a common practice to build only one producer to a through bed; and this has many obvious advantages, especially where discharging-machines of the pusher type are in use. With horizontal retorts so heated, it is rarely necessary to fix a damper to regulate the amount of producer gas flowing to the back half of the setting. With inclined settings, however, especially with good large producer-nostrils, some kind of regulation is almost essential. A damper should be fixed here, and regulated by someone who understands its purpose, and before it becomes fused fast. An alternative is to pass the gases through an opening which can be partially bricked-up when the beds are at work. Not long ago I had to deal with some settings in which an attempt had been made to do away with this damper. The gases were simply restricted by having to pass through a hole in the centre wall, 9 inches wide by 15 inches deep. The producer-nostrils were good large ones, with the result that it was much easier to get the producer gas into the upper half of the setting than it was to get the secondary air. The upper ends of the retorts were quite hot enough, while sufficient producer gas could not be drawn to the bottom end even with the dampers wide open. With the secondary-air slides wide open, it was impossible to get sufficient secondary air into the upper chamber, except by curtailing the primary-air slides, which made the lower half of the retorts worse still. By building up about half of the 9 in. by 15 in. opening, matters were put right.

Combustion Chambers.

Fig. 10 shows a combustion chamber for beds set in three vertical tiers, with only two retorts in the bottom horizontal tier.

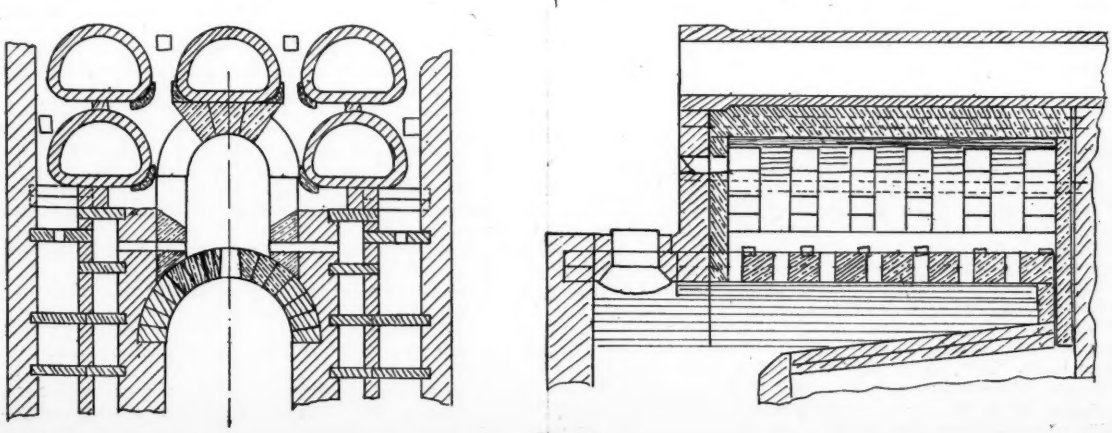


Fig. 10.

The design has some faults:—

1.—It would be better to have two rows of producer nostrils.
2.—The nostrils should be opposite the secondary ports, and should come in the spaces between the stay-walls.
3.—The retorts in the second tier should be a little wider apart.
4.—The expansion cavities are not shown correctly.
5.—There are two producers instead of one, per bed.
6.—The regenerator if of an obsolete pattern.

The chief points to watch in the designing of a combustion chamber are—

1.—It should be large enough to permit a man to get in comfortably for purposes of inspection and repairs. This incidentally ensures ample space for the mixing of the gases and the absence of such cutting heats as are prevalent with small combustion chambers.
2.—The point where the producer gas and secondary air meet should be well below the beds of the bottom retorts. Otherwise these retorts will probably be found to be cooler than the rest.
3.—The secondary-air ports and producer-nostrils should be close together, and should not be directly underneath the stay-walls.
4.—There should be two rows of producer-nostrils when the retorts are set in three vertical tiers, in order to prevent the flames playing directly on the retort above the combustion chamber.
5.—The whole of the brickwork in and around the combustion chamber should be of the best silica, loosely laid together. Wherever the silica forms a continuous wall or arch from back to front of the bed, there should be a cavity at each end for expansion.
6.—If there is a retort immediately above the chamber, it should be well shielded along its whole length, as indicated in fig. 10.
7.—There should be a clear space of at least 6 inches between each vertical tier of retorts, to prevent cutting heats where the gases leave the chamber.
8.—The corners of all the retorts around the combustion chamber should be protected by silica shield tiles.
9.—The combustion chamber arches should be built with 9-inch blocks. The springing line of these arches should not be above the middle of the bottom retorts, unless the sides of the chamber are arched to prevent the thrust of these retorts bulging them inwards.
10.—Segmental combustion-chamber arches should not be used, because they transmit too much weight on the retorts.
11.—The secondary-air inlets should be large (say) 4 inches square, and as straight as possible. They should not be made flush with the top of the producer-arch, as they are then liable to become choked. If the secondary air is carried up over the producer-arch, it should be built in specially moulded tubes. These ensure a smooth surface, and there is therefore less liability to choke.

Retorts can be much more evenly heated when set in two vertical tiers than when set in three. Some of the advantages of the former system are—

1.—A higher average temperature may be safely maintained; no retort being in such a position as to get overheated.
2.—The life of the various retorts is about the same. This means a great saving in repairs.

Stay-Walls.

Now that high heats and charging machinery are so much in evidence, it is more than ever necessary that retorts should be securely stayed. The stay-walls should never be more than 9 inches apart, and, with inclined settings, not less than 9 inches thick. Provided that they are not more than 9 inches apart, and are well built and firmly fitted to the retort, there is no reason why the stay-walls in horizontal settings should be more than 4½ inches thick, except in the region of the combustion chamber. It is a common practice with some firms, however, to save labour by simply butting the bricks against the retorts in the stay-walls—a practice which should not be tolerated. The stay-walls should never be supported on arches resting on the retorts. The centre wall should be carried up to the main arch. In the case of inclined settings, some firms are now building the bricks in the stay-walls at the same angle as the retort, instead of giving them a flat bed. I cannot say that I like the innovation, because there appears to be a great tendency for everything to slide downwards. Personally, I have not yet had sufficient experience with this class of stay-wall to enable me to pass judgment on it. It is argued by some people that, since the retorts taper upwards, the walls cannot slip down. The taper appears to me to be too slight to be of much service in this way. It is a common practice to build piers, or soldiers, from the top of the stay-walls to the main arch. If these are built, they should never be put directly over the top retorts, because the weight thus put upon the latter may seriously damage them. The better plan is to leave these soldiers out altogether. The contention is that they tend to strengthen the main arch. In my opinion, the reverse is the case. If the arch is inclined to sink, these isolated points of support will only tend to unkey it, and so make matters worse. In many cases, I have known the arch to rise considerably, thus leaving the soldiers free to fall into the setting.

Number of Retorts per Bed.

In small works, it is necessary to have small units, in order to accommodate the make to the output. In large works, the capacity of each bed should be as great as can be conveniently worked. I know a case where beds of twelve and beds of eight are working side by side under otherwise exactly similar conditions. A fuel test, carefully executed, indicated that the total fuel consumption in each of the two classes of bed was practically identical—showing a reduction of 33 per cent. in favour of the beds of twelve.

Retorts.

The retorts should be the very best that can be bought. It is a very common thing to find the stay-walls in perfectly good condition when the retorts have collapsed. Apart from anything else, the cost of renewing these walls will more than balance the difference in price between good and bad retorts. In addition to being made of good material, it is essential, in the case of through retorts, that the sections should be free from twist. I have seen badly twisted retorts fitted together, and, before a reasonably true joint could be shown inside, one of the lengths was cut down to about 1½ inches in thickness. All the sections of each retort should be fitted together on a perfectly level gantry before being put in position. In no place should the joint exceed ⅜ inch. Care should be taken that the retort is firmly bedded on each stay-wall and on the spot course.

The front walls of the setting should be 1 ft. 1½ in. thick; a reveal being provided to break the joint all up the pier walls and round the main arch. There should be a good supply of fire-clay sight-plugs for inspection purposes—those in the combustion chamber, under the main arch, and in the flue where the waste gases enter the regenerator being essential to good working. The latter are particularly useful for collecting samples of waste gases for analysis. It is absolutely useless to take these just above the damper, as is often done, especially if the regenerators are leaky. I have known gases taken at the entrance to the regenerator show 2 per cent. of carbonic oxide when a sample taken above the damper showed 5 per cent. of oxygen.

Where there are no special dampers to regulate the temperature of the various parts of the setting, it is important that the gases be drawn to the front walls before passing to the regenerator. This tends to pull the gases away from the centre of the bed; and without some such arrangement, it is absolutely impossible to get the retorts evenly heated. In one case, I saw a test bed where this was not done. The ends of the retorts were black when the centres were a good carbonizing heat.

The same bed had another obvious defect, which had to be put right before it was workable. The centre wall was left down just above the top of the retorts. It was argued that there was level gauge under the main arch when a setting was in good working order, and that therefore there would be no tendency for the gases to pass over the centre wall in either direction. Practice did not bear out this theory, and the wall had to be built up to the main arch with puddles to avoid letting down the bed.

The Regenerator.

Almost every single firm of gas-works contractors has its own patent regenerator, which it naturally claims to be the best on the market. Good fuel results cannot be obtained without a good regenerator. Theoretically it is only in the recuperation of heat from the waste gases that gaseous firing can claim any advantage in fuel consumption over the direct-fired setting with controllable air supply. I do not propose to describe any particular form of regenerator, but to confine my remarks to stating the factors which, in my opinion, help to make a good one.

1.—All the increment in the temperature of the secondary air should be gained at the expense of the waste gases. In many cases a very large proportion of this heat is derived from the producer, and is therefore no actual gain in heat at all. It is simply taking the heat from the producer to the combustion chamber through another channel.
2.—There should be as much surface of the secondary flues as possible exposed to the waste gases.
3.—The dividing walls between the secondary-air and waste-gas flues should be as thin as possible compatible with safety.
4.—Large flat thin partition walls should be avoided.
5.—The secondary-air flues should be accessible throughout for pointing purposes. Leaks are best pointed from the secondary-air side, where the pull of the chimney tends to draw the patching material into the leak. When pointed from the waste-gas side, the tendency is to pull the patching material out.
6.—There should be no straight joints between the secondary-air flues and the waste-gas flues.
7.—If tubes are used, they should be relieved of the weight of the superincumbent regenerator work.
8.—There should be as little opportunity as possible for flue dust to collect, and provision should be made to remove what does collect.
9.—If possible, there should be a common flue on top of the regenerator, from which all the secondary-air ports are taken in straight channels. This facilitates the removal of any foreign matter that may drop down the ports.

10.—The secondary-air flues should not be too tortuous, and should be of ample area. Otherwise it may be found to be difficult to get the secondary air up into the combustion chamber without an excessive amount of vacuum, which usually entails waste of fuel and unequal heating.

11.—The regenerator should be as simple as possible to understand, and not costly to build or repair.

Producer Bracing.

I have noticed a great tendency in recent years to do away with producer bracing, or reduce it to a minimum. The result is that one often finds producer and regenerator fronts bulged out very considerably. I know cases where this has happened to the extent of at least 4 inches. The effect of this on the joints of the regenerator work can easily be imagined. When one sees the regenerators of inclined settings, about 20 feet in depth, without bracing or with only a single horizontal stay, it makes one think that economy is being pushed a little bit too far.

Mouthpieces.

Flanged mouthpieces are usually preferred to socket mouthpieces, and I think rightly so. Unless the mouthpiece bracing is tightly set up to the mouthpieces and remains there, there is great danger of the socket falling away from the retort and causing troublesome leakage. If the mouthpiece should get broken, it will be found to be much more difficult to replace than a flanged one. There are two arguments in favour of the socket mouthpiece: (1) There are no bolts to burn away; (2) there are no bolts to interfere with the fixing of the bracing. When flanged mouthpieces are used, care should be taken that the retort bolts do not foul the bracing. With segmental retorts, a socket mouthpiece or a loose socket with a flanged mouthpiece is essential. I prefer the latter type.

Retort Bolts.

For retort bolts a good long thread should be provided at one end, but at the other it should only be just long enough to go through the nut. If the threads are longer than this when supplied, they should be so damaged that it is impossible to get the nut too far on. Neglect of this precaution has, to my knowledge, resulted in the front of many a retort being jacked off. The space around the latter nut should be filled with stiff clay, to prevent leaky bolt-holes.

Ascension-Pipes.

Ascension-pipes form a very important factor in a retort-bench. To discuss the matter fully would take too long, so I propose to make a few recommendations without further comment. The ascension-pipes should be (*a*) as straight as possible; no sharp or return bends being permitted. (*b*) They should be short, in order to prevent unnecessary condensation. (*c*) They should be as free from joints as possible. All joints should be truly central, and, if of the socket-and-spigot type, it is a good plan to make them with lime finished off with about ½-inch of fire-clay and borings. (*d*) They should be smooth inside. (*e*) They should be on one side only of through retorts, except where it is proposed to fill the latter. If one pipe only is used, it should be about 8 inches diameter. (*f*) They should be the same diameter throughout.

Tests for Fuel Consumption.

At present there appears to be no standard method of estimating the fuel consumption of producers. It would be a great boon if a set of rules for testing this most important factor were drawn up and universally recognized. It is a common thing for contracting firms to guarantee a certain consumption of fuel for a setting (say, 12 lbs. per 100 lbs. of coal carbonized), whereas no stringent regulations are laid down as to the manner in which the consumption is to be determined. The result is that the test frequently develops into a mere farce; and the guarantee is fulfilled even though the fires may be consuming anything up to 20 lbs. per 100 lbs. under the ordinary working conditions. There are, therefore, no reliable means of ascertaining whether a setting will give good or bad results until it has been installed, when the manager learns from experience how much the fuel guarantee was worth. In order to get business, contractors are apt to claim ridiculously low fuel consumptions, relying on the looseness of the restrictions to get their test accepted. They know that if they state what they believe to be the actual working fuel consumption, they will be out of the running altogether. I give below a few of the rules which should be laid down for every fuel test, if the latter is to be of any use at all.

1.—The temperature of the retorts at the finish of the test should be as high as at the start.

2.—The fuel test should be made at the same time as the test for the yield of gas per ton.

3.—The test should last at least a week.

4.—The dampers and air-slides should be properly adjusted several days before the test commences, and no alteration to these, or tampering with them in any way, should be permitted until the test is complete.

5.—The fires should not be fed more often than can conveniently be done in ordinary working, and the usual times of clinkering should be adhered to.

6.—The plant should be at work several months before making the test.

These are only a few of the rules which should be enforced.

Time will not permit me to discuss the merits of the numerous ways of making fuel tests. I must confess, however, that the accuracy of all methods with which I am acquainted is more or less debatable. I prefer to leave the choice of a standard method in more capable hands, and merely respectfully suggest that we are greatly in need of such a standard.

Discussion.

The President (Mr. R. S. Ramsden, of Burton-on-Trent) remarked that the paper was an able one; and he hoped there would be a good discussion.

Mr. S. Messenger (Saltley) said he thoroughly agreed with the author's remarks as to the need for careful watching for filling-in with rubbish when using four courses of stretchers to one course of headers with pier walls. As to main arches, he thought these should be built of 9 in. by 9 in. bricks, and that 9 in. by 4½ in. bricks would hardly make as good a job. With the former, there was a half bond of 4½ inches, but with the other only a bond of 2¼ inches. Anyone who had seen settings that had been worked at the temperatures of modern days knew that the joints were affected. As regarded tie-rods being built in settings, he agreed that this should not be done. He had seen settings where the tie-rods had been built in, and had been burnt right away. When letting beds down for repairs, they should always tighten the nuts at the ends of the settings, taking careful note of the extent to which this tightening was carried out; and then when the setting had been re-arranged, the nuts should be slackened accordingly. He was in agreement with the author in his statement that the primary air should be admitted through the clinkering door, instead of through flues at the side. There was more trouble in cleaning these latter out than they were worth. He had had a little experience with the curtain arch; and to his mind there was nothing much in it. Where he saw it in operation, they could not get a full fire at the back. On the subject of the producer arch, he did not find himself entirely in agreement with the author. Mr. Brooke thought the centre should be built of silica and the remainder of good fire-brick. Well, in a setting of this kind of which he himself had had experience, and which, after being at work about eighteen months, was then let down for repair, it was found that the silica material in the centre had lifted and there was cracking of the inner ring. They removed the silica, and replaced it with Stourbridge brick; and the setting had now been working for some two years, and giving very satisfactory results. While speaking about fire-bricks, he might say it was very important, when setting fire-bricks, that they should use the same clay as the bricks were composed of. As to retort-bolts, they got over the difficulty referred to by the author by not using a nut in the retort, but employing in its place a cotter-pin. Producer bracing was, he thought, neglected in the majority of gas-works. They could not brace a producer too much.

Mr. A. O. Jones (West Bromwich) said that for regenerators the author mentioned a cast-iron dished charging door, as being better than an iron door cased with fire-brick. Did he find overheating of the doors when they had no lining of fire-brick? He agreed with Mr. Messenger about producer arches being built all of the same material. As a matter of fact, he did not think it at all necessary to use silica for producer arches, because, speaking of regenerator settings at all events, the temperature inside the producer should not be so high as to necessitate the employment of special fire-brick. It was only in the combustion chamber that the temperature should be so high as to require this. As to the stay walls, at West Bromwich they were in the habit of making these 9 inches between the centre retorts and the outside, and 4½ inches between the outside retorts and the main arch. By doing this, they got much better heating. This, he thought, was the idea really suggested by the author. Speaking of flanged mouthpieces, did the author mean a flanged mouthpiece bolted directly on to the retort, or a cast-iron socket on the plain end of the retort, and then a flanged mouthpiece fastened on to it?

Mr. Brooke: A retort with a flange bolted direct on to it. I prefer this to bolting it on to a loose socket.

Mr. Jones: Personally, I prefer a mouthpiece with the socket and the mouthpiece all in one.

Mr. A. Hancox (Great Malvern), referring to the filling-up of the spandrils with rubbish, said this was a matter on which he could speak with experience, because he had one or two narrow escapes on going on to a bed where this had been done. A 6 or 9 inch lining was suggested for the producer. At his works, they had a 4½-inch special brick. Two beds had been under continuous fire for 1308 days; and at the time of letting-down and examining, they found not less than 1 inch of material between the fire and secondary air flue anywhere. Therefore, he did not think it would be necessary to go to the expense of a 9-inch lining. He agreed with the author's remarks as to the use of the "S.P." brand of Yorkshire silica for producer arches. At his works, they were using it now; and until they did so, they had considerable trouble with the arches. They were taking a bench to pieces that had been working a little over four years, and which had the arches put in in "S.P." silica; and the whole of the arches were practically as good as when they were erected. With reference to the author's remark that, in the case of inclined settings, some firms were now building the bricks in the stay walls at the same angle as the retort, he might say that this had been done at Malvern; and in the work that they were taking to pieces, there was no sign of any brick having moved. Until the "S.P." brick was introduced at Malvern, they had considerable trouble with the secondary air inlets, because the portion of the arch which used to fuse stopped them up; but now that they had special bricks which raised the

inlet about 6 inches off the arch, this difficulty was overcome. As to mouthpieces, they had both sockets and flanges at Malvern; and they had more trouble with the flanges than with the sockets. In the case of a retort being worn thin in the socket, they found it quite easy to make it good—much more so than they would with a flange.

Mr. W. H. Johns (Saltley) said he had found from past experience that the socketed mouthpiece made a better job than the flange. He had been engaged with a constructing firm who had all kinds; but when he was with them, the great demand was for socketed mouthpieces. When he was at Bath, they had a lot of trouble with their retort mouthpieces; but when they adopted the socket form, well braced, the difficulty was overcome. Too much stress could not be laid upon the necessity of having good foundations for retort-settings, as well as for all other heavy buildings or structures. Experiences with settlement such as the author had mentioned were not desirable, apart from the anxiety they caused. The utmost care must be exercised in determining the depth and nature of the foundations to be employed. Where the subsoil consisted of rock, gravel, or sandy earths in their natural strata, the proceedings were very simple, and should cause no anxiety as regarded insufficient stability; but when soft clay or running sand, or other more or less treacherous soils, were met with, great precautions had to be taken, and it was only by past experience that one could really be guided, and engineering skill had to be brought to bear on the matter. He did not agree with the author in throwing the responsibility for foundation work upon the contractor. If a man was supposed to be an engineer, then let him be one, and take the responsibility on his own shoulders. Otherwise the credit for the work should be given to the contractor entirely. Foundation work had invariably been carried out by the gas engineer in all works with which he had been associated; and this was, he believed, the general practice in gas-works. He mentioned this so as to show some of the juniors that foundation work must be studied by those who wanted to become gas engineers. The movable platform referred to in the paper was, he supposed, only practicable for small works. It could not very well be used where stoking machinery had to be employed. The allusion to the area of the chimneys and main flues was one of the most important things in the paper. Unless they had a good chimney draught, it was impossible to work any retort-setting properly. They might have the best workmanship and the best material; but unless they could maintain a good pull on the settings, which could afterwards be governed-down to the working pull, they could do nothing with the beds. They should have ample area in the chimney and main flue. In fact, sufficient area should be provided to enable the beds removed farthest away from the chimney to be worked at good temperatures with a steady pull. He did not think there was any necessity to run the pier walls 18 inches throughout in all cases. They might be reduced to 14 inches from the top of the regenerators. This, however, was governed to a great extent by the span of the arches, number of retorts in a bed, and the total weight they had to carry. The end walls acted as buttresses, and should in all cases be at least three times as thick as the ordinary pier walls. In the footings of the piers, the bottom course should be twice the width of the main pier, and gradually reduced down as each course rose, until the thickness of the pier was reached. He also thought that the main arch should be formed in all cases with a reveal at the front, to enable the front wall of the bed to cover, instead of forming a straight joint. It was at this point when beds had been got to work that a crack usually developed. As to the primary air supply, the author spoke of the short-circuiting of the air in the front part of the producer. He said in any case the fires should be well ashed-up with wet ashes in front. He (the speaker) was not quite clear as to the meaning of this. He did not believe the air did short-circuit there, providing that everything was in proper order. Some months back, there was an apparatus patented, in which the idea was to remove some of the ashes and clinker formed in the bottom portion of the producer, and so permit the free access of primary air at this point. It was absolutely necessary that no primary air should enter the producer in any other way than at the proper openings, whether they were in the clinkering door or at the back or the side of the producer. In the latter case, of course, the air was to a certain extent preheated. The flanges of the doors should be machine faced and be kept quite tight. The proper amount of primary air was then assured. When dealing with the charging opening and door, the author said: "In cases where they adopt the useful practice of putting extra pull on each section immediately that section is charged, in order to increase the make without seriously reducing the quality (which can easily be done by a system of retort-house governors), the prolonging of the draw means considerable waste in gas." In an earlier portion of the paper he said it was desirable to have separate hydraulic mains, one to each bed. Now he said each section, as soon as it was charged, should have an extra pull put on. Would it be necessary to have one retort-house governor in this case to each bed? He was afraid such a practice could only be carried out in small gas-works. Where there were beds being charged while others were being worked, and there was always some retort lid or door open, it would be impossible to have a heavy pull on. What seal would be required, and had any difficulty been experienced with stopped pipes? Then the author mentioned that in very small gas-works it was not necessary to go to the expense of regenerator furnaces. While agreeing with this, he thought one should not be contented nowadays with the ordinary direct-fired furnace. A simple form of generator could easily be adopted and worked successfully in such a works. Of course, he was aware that in a good many small works the ordinary direct-fired furnace had been adapted to the generative system by heating the primary air. This was a great improvement. Considerable saving was effected on the fuel account, and the wear and tear was also much lessened, when generator furnaces came to be adopted.

Mr. Hancox thought it was necessary to have the fire loose and light at the bottom; but still they must at the same time have some fine material put on the front of the fire, to stop any short-circuiting of air. With regard to the extra pull, if retort-house governors were fixed, as the retorts were charged the extra volume of gas would open the governor to give a larger passage, and this would give the extra pull.

The Hon. Secretary (Mr. G. C. Pearson, of Nechells) remarked that the paper abounded in points on which comment might be raised. There was no doubt a great advantage could be gained by putting on a little extra pull as the gas was being made at first after the retort was charged. Mr. Hancox said the retort-house governor opening to give a larger passage would furnish this extra pull, but that was hardly correct. The actual pull would remain constant; and by increasing the pull there was no doubt they would gain a little that otherwise would be lost. Mr. Johns pointed out that in a large retort-house they always had retort-lids open; but surely they might have a retort-house governor to each section, so that the pull could be adjusted to each section. "A section," of course, could be any number of beds; and then it could be arranged for the draws to take place so that the pull could be put on when the retorts were charged. It would be well if the author explained more fully what was meant by the loss of gas which would occur from the retorts having to stand, because one would not think that there would be any loss of gas.

Mr. Johns said he took it the author wanted to get as much gas as possible by an extra pull. The idea of the governor was not in the ordinary sense to over-pull, but to work as near as possible at zero. Mr. Brooke wanted to get through the draw as rapidly as possible in order to begin making gas again.

The Hon. Secretary (continuing) said speaking of spandrils, the author had remarked that if backing-up material was cheap, three or four extra courses on top were never wasted. A very great advantage of having a good deal of backing-up material on the spandril arches was that if they had a leakage of liquor or a valve break, the liquor had time to evaporate before causing any trouble. As to silica arches, silica was always more or less of a trouble in heating and cooling; and in a producer arch they had also a lower temperature underneath than above. In the producer they actually had a temperature of 500° Fahr. lower than in the combustion chamber itself. When they were using a material that expanded a good deal, they could imagine there would be cracking when it was heated very much on one side and not so much on the other. Fire-brick arches they found stood very well. A certain amount of material melted; but so long as the secondary air ports were kept well up, there was no danger of it blocking them, and the arches were none the weaker from the fact that they were running. In regard to primary air flues running alongside the ash-pan, it was a question whether it was not better to introduce the primary air in this way, from the point of view that it was better distributed; but a great objection to it was that the flues weakened the support of the bearer bars. As to the standardization of fuel consumption tests, there ought to be some description of the coal. It should not be a slack or a coal containing a large amount of bats likely to form bad clinker. For ascension-pipes, he thought just ordinary cement run joints were very good. He would like an opinion as to carrying the centre wall right through the combustion chamber.

Mr. W. S. Smart (Saltley) agreed with Mr. Johns in the remarks he made as to throwing responsibility on contractors; but he thought the author was probably referring to the smaller works. In any case, in future with vertical retorts they would find themselves faced with a more difficult problem. With the ordinary retorts, the loads were more or less evenly distributed over the setting; but with verticals they would have heavy isolated loads which would be most difficult to carry properly. It was very interesting to note how the buckstay had been increased in size and weight to meet the demands made upon it. This continual additional weight being placed on the buckstays, could not help making the problem of foundations more difficult to settle. Expanded metal, which the author referred to, was exceedingly useful; but the author mentioned using it with concrete 3 feet thick, when it would not be so economical. It was well to use a sheet of expanded metal at the bottom and also at the top. In connection with foundations, too much reliance should not be placed upon text-book figures as to the strength of concrete. They were ordinarily given on the assumption that concrete was three, six, or twelve months old; whereas generally speaking the loads came upon it very quickly after it had been put in. He would be glad to know if the author had had any experience of steel chimneys. Of course, they did not look so well. Did the author favour putting tie-rods across the bottom of buckstays?

Mr. F. J. Ward (Knowle) said he did not for a moment claim to be the author of the particular operation of putting an extra pull on the bed, which had been referred to; but he did believe he was the first to mention it in public, in the paper he read before the Institution of Gas Engineers last summer. It had been said that it was difficult to apply in large works; but this was not the case.

It was difficult if they had simple dip-pipes; but with anti-dips it was not. At Knowle, he had some anti-dips of his own design. As to pier walls, no doubt a thickness of 18 inches was correct for large works; but it was not for small ones. In a small works, of course, they had radiation all round. He had pier walls 2 ft. 3 in.; and he found even this was none too much. If it was impossible for them to place their hands without discomfort on an end wall, the thickness of the wall should be increased. As to direct-fired settings, it was said that these should be put in small works, on account of the class of man usually found there. Speaking for himself, his Directors did not tie him down very closely; and so at the moment he was advising several other works. He knew the type of men usually engaged; and he had seen them working regenerators in a very peculiar way indeed. But if the right man was there, nothing should be put in small works except regenerative furnaces; and if a man was not capable of working them, he should be replaced by one who could. The regenerative furnace was the correct thing to his mind, because a man could start in the morning with as good heats as he left at night. He could not do this with a direct-fired setting. The author said the ash-pan should always be provided with an overflow delivering into a gutter in front of the bench. He thought it should not, because they should never allow anything to overflow from the ash-pan, as by so doing they were letting heat go to waste.

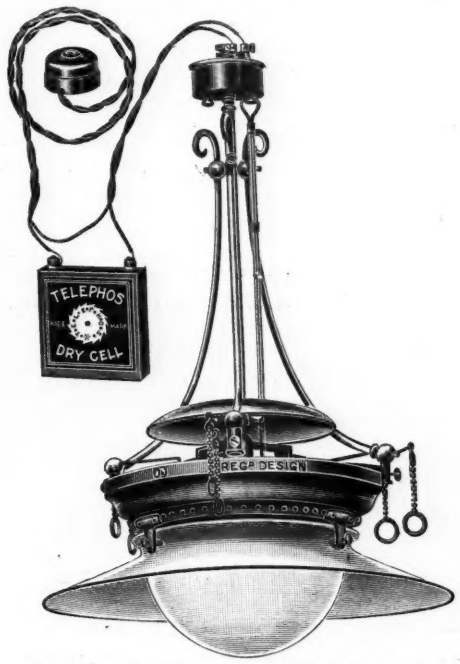
The PRESIDENT asked whether the author was not rather severe on the contractors in saying that cement concrete should be pulled out if not set in 24 hours. Mr. Smart had referred to putting in extra tie-rods at the bottom of the buckstays. The same idea had occurred to him; and it seemed an additional safeguard which it might be as well to take. Had Mr. Brooke ever done anything of the kind? And had he a formula for calculating the strength of buckstays? With regard to pier walls, did Mr. Brooke recommend 3 inch or 2½ inch brick? He had much pleasure in proposing a hearty vote of thanks to the author for his paper, which was full of information that would be useful to them.

Mr. SMART seconded the vote, which was carried with applause.

Mr. BROOKE, after thanking the members for the way in which they had received his paper, said he had purposely raised points which might be considered debatable, and he thought most of them had been picked out in the course of the discussion. Mr. Messenger preferred 9-inch by 9-inch to 9-inch by 4½-inch end arch bricks. No doubt, the former made a very good job; and, as pointed out, they were half bond instead of quarter bond. It seemed to him (the speaker), however, that the strength was not so much required in the longitudinal direction. There was not much danger of the joints drawing out. With regard to silica in the centre of the producer arch, he thought he recognized the case to which Mr. Messenger had referred, because he was on the same gas-works; and, if so, the arch was not semicircular, but more of the shape shown in fig. 5, with the same tendency for the silica to lift. Certainly, he had never had any trouble with silica arches lifting except in this one case, and then he attributed it chiefly to the shape of the arch. As to Mr. Jones's question about cast-iron doors without a fire-brick lining getting over-heated, there was certainly a tendency for them to get hot; but they were cheap. Then Mr. Jones preferred to have fire-brick entirely in the producer arch, because there should not be a high temperature there. He agreed that there should not be a high temperature underneath the producer arch; but above it they needed a good temperature. If they were to expose fire-brick to the temperature prevalent in the combustion chamber, and had the arch partly softening, he really must say that he could not see that this arch could possess the strength which it would have if it were made of a material that would not flux. With reference to the stay walls, Mr. Jones said he used 9-inch in the centre and 4½-inch outside. Of course, this was somewhat similar to what was indicated in the paper; but in this case he took it that outside the retorts the stay walls would be at least 1 ft. 1½ in. apart, which he thought was rather too much. His only reason for preferring flanged mouthpieces was that he had had a great deal of trouble with socket ones falling away, From what he saw, it seemed that most contractors preferred the flanged form. Mr. Hancox preferred a 4½-inch producer lining, provided it was made of very special brick. No doubt, the nature of the brick in the producer lining had a great deal to do with its life. One did not want a brick specially refractory; but it needed to be one that would stand the clinkering bar. The 1308 days to which he alluded was a very good life. Mr. Johns had said an engineer should be an engineer. What he said in his paper was, "If you have not had considerable experience, do not attempt to put in foundations." They could not always have a thoroughly qualified man for a small works; and a man on such a works had very rarely had the privilege of seeing foundations put in, or of supervising this work. In such a case, it was wiser to leave them alone. Certainly, Scott's platform was only for small works, and could not be used with charging machinery. As to the statement that pier walls should be cut down to 14 inches from the top of the regenerators, he thought 18 inches was enough to cut them down to. Then Mr. Johns said the end walls should be three times as thick as the pier walls, which seemed to him rather a liberal allowance. He quite agreed that the main arch should be formed with a reveal in front. In regard to the extra pull on each section, he was thinking of a section of three or four beds—not of having a governor for each bed. They could work them each with a separate weir-valve, and still have one governor for four beds. If they had a section of three or four beds, they could very easily get on the extra pull by having a water counterbalance on the retort-house governor. He found it useful to put on 3-10ths or 4-10ths extra. Direct-fired settings with a controllable air supply were, in his opinion, as good practically as a generator; and he would hardly care to go to the extra cost of putting in a generator. Mr. Hancox referred to the extra gas opening the retort-house governor. Of course, this did not affect the pull on the bed. They had to alter the weighting of the governor to do this. Mr. Pearson alluded to the fuel tests. Of course, only a few of the points were mentioned; and if necessary coal would be taken into account in making out rules. At any rate, it would be an advantage to have some mention of the coal in comparing one man's work with another. The centre wall of the combustion chamber he thought was necessary. He had experimented with leaving it out, but had had to build it in afterwards. He had had no experience of steel chimneys. As to nothing but regenerators being used, of course, in small works the pay was not always such as to secure good men for working them. The overflow to the ash-pan he meant simply for emergencies. If cement concrete was not set in 24 hours, he thought it showed that it was not good; and they should pull out merely the portion that was bad. He had never seen tie-rods put across the bottom of buckstays, so he would rather not express an opinion on this. He could not give a formula for strength of buckstays; and he did not think anyone could. He should prefer pier walls of 3-inch bricks, instead of 2½-inch. It saved labour; and he did not think there was anything to be gained by putting in the smaller brick.

TELEPHOS CONTROL OF CLUSTER LAMPS.

An excellent arrangement for the distance lighting of cluster lamps in shop windows and other places where a bye-pass is objected to, or where people do not want to go to the lamp to turn it on and off, is now to be seen in the show-rooms of Messrs. A. E. Podmore and Co., at Charles Street, Hatton Garden. Briefly, it is the adaptation of the Telephos system to a well-known type of Podmore multiple burner lamp. In a practical demonstration with a three-burner lamp, the device showed itself to be perfectly successful; and Messrs. Podmore and the Telephos Company are naturally pleased with the result, for they claim to be the first who have accomplished what they have done.



Telephos Arrangement on a Podmore Cluster Lamp.

The valve-box is, as shown, fitted in the supply-pipe above the lamp, and two small tubes are provided down which the gas and electric current pass to form the bye-pass. On pressing the push, two streams of gas travel down this pipe, and at the end join and are ignited by the electric "spit-fire." The pressure on the push also turns on the main gas supply; and the burners are all lighted by the one bye-pass, which goes out as soon as the finger is removed from the push. Another pressing of the button turns the lights out. The difficulty to be overcome was the greater length of tube required for the igniter. This tube has been arranged so that when the igniter itself needs renewing, the end only has to be taken from the tube, thus saving some expense. The tube should have a long life, as it is specially protected to withstand the heat, which is, of course, greater than in the case of an ordinary single-burner lamp. In the Podmore lamp referred to, the burners are separately controlled, so that it is not necessary to have all of them alight if only one or two are required. The

Telephos attachment is so small that it is hardly noticeable; and thus the lamp is in no way prejudiced in appearance by its addition. Altogether, it is an arrangement which should find an extensive field open to it in the circumstances mentioned in the first lines of this article.

To all Podmore inside and outside inverted lamps there is fitted their patent heavy cast-brass British-made burner. This burner, when needful, can be taken right out, by merely undoing a set-screw, without taking the lamp down.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mr. Carr and the Standard Burner Bills.

SIR,—In his letter to you dated Feb. 4, Mr. Isaac Carr states that he succeeded in establishing a difference of 4·7 candles between the No. 1 "London" and the No. 2 "Metropolitan" burners at the Craven Street testing-station. This is incorrect.

What really happened was that the *modus operandi* of photometrical testing was explained to Sir Henry Kimber and the other members of his Committee; and, to do this, readings of the photometer were taken. But to describe them as establishing anything is grotesque.

If Mr. Carr would only add, after the word establishing, "to my own entire satisfaction," no one would contradict him.

CHARLES CARPENTER.

South Metropolitan Gas Company, Feb. 10, 1911.

Liverpool Corporation and the Standard Burner Bills.

SIR,—Will you permit me to correct an error in the third paragraph of my letter of last week, where, in speaking of my views (with which the Corporation concurred), I said: "At the outset they accepted my view that the illuminating power might be reduced from 20 candles in the No. 2 'Metropolitan' argand, provided that . . . &c." This should have read: "from 20 candles in the No. 7 standard flat-flame burner to 20 candles in the No. 2 'Metropolitan' argand, provided that . . . &c."

Now, a further word with regard to your comments upon my letter, where you say it is a singular thing my having condemned the No. 2 "Metropolitan" burner in evidence before the House of Commons Committee, and yet recommended its adoption to the Corporation.

The explanation of my action is obvious to anyone acquainted with the vagaries of this burner. In the case of the Liverpool Corporation, the No. 2 "Metropolitan" argand is to be used for testing 20-candle gas when the damper will be full open, and the air-ways of the burner employed to their full limit. When testing gas of 20 candles and over, the burner is much the same as some other standard argands that have been made statutory of recent years.

My objection to the No. 2 "Metropolitan" argand is when it is used for testing low-grade gas, which necessitates the damper being brought into play. I say that for testing gas of low illuminating power, I regard this burner as a pernicious device; for the reason that it can be made to falsify illuminating power results in the way I explained to the House of Commons Committee (which explanation you were good enough to re-publish last week).

In other words, the burner can be made to act, in a measure, on the principle of the now common petrol gas-burner. In the petrol burner, almost the whole of the air necessary for the combustion comes along the pipe together with the gas to the point of ignition. In the No. 2 "Metropolitan" argand, air that may be in the gas in sufficient quantity to destroy its usefulness to the consumer, can, by the closing of the damper, be made to support combustion; and yet the presence of this air, to a very considerable extent, goes undetected in the illuminating power test. This I regard as a fatal defect; and I say that any burner that is capable of such manipulation ought not to be employed as a standard.

The object of my letter of last week was not to try and convert either you or the promoters of the Gas Companies Standard Burner Bills to my way of thinking; but to direct attention to what was, in my opinion, unjustifiable adverse criticism on the action of the Liverpool Corporation, and your partisan strictures upon my evidence. The question of your "conversion"—also that of others—I am content to leave to circumstances, of the dawn of which there are already very ominous signs.

The two years term (you charge me with not referring to) agreed upon by the Corporation and the Gas Company, for the duration of the agreement, is a factor in the case; but at the expiration of this period, I think the Corporation may be relied upon, as hitherto, to do whatever may be in their power for the protection of the consumers.

ISAAC CARR.

Widnes, Feb. 11, 1911.

[We have carefully read Mr. Carr's letter, and re-read the official report of the evidence he gave last session bearing upon the controversial parts of the letter; and to deal with these parts would only mean an undue prolongation of the discussion of a matter that has been settled once and for all. The whole subject has been argued up and down *ad nauseam*; and Mr. Carr's arguments fall to pieces one after the other against the rock of a large and still growing experience. We prefer to pass judgment on realities; and, in this instance, the realities do not disturb us with anything that can be regarded as "ominous"—the realities being considerably more extensive than experiments with, designedly for trial purposes, adulterated gas at Widnes. In the business of gas supply, no one in the professional ranks would be foolish enough to be guilty of acts that would be fatal to their business, and bring it into destructive disrepute. There would soon be an end to that sort of thing. We are not yet shown why the Liverpool Corporation are taking the trouble to ask for the use of the "Metropolitan" No. 2 burner for testing Fazakerley gas. If they are not going to use the burner as the standard, the application is superfluous—not to say absurd. If they are going to employ it as a standard, then a table Mr. Carr put before the Commons Committee shows that the Corporation will be able to supply what the new standard calls a 20·3 candle gas, but which the flat-flame No. 7 standard will only call 14·7 candles. The Fazakerley consumers even then will not require our sympathy. But perhaps it is better not to say more, lest, on the evidence of Mr. Carr last session, the Corporation decide to abandon what is a very proper step in asking for authorization to use the new burner. As to what the Corporation will do in two years' time, it is rather early for covert threats.—ED. J. G. L.]

West Bromwich Gas Supply.

SIR,—I was somewhat surprised to notice this morning in the current issue of the "JOURNAL" a paragraph relating to this undertaking, which is, in my opinion, *per se*, calculated to be somewhat misleading, and not only an injustice to the department, but a distinct reflection on myself as its responsible official.

The first speaker, in using the term "high-water mark" was merely seeking information; and the Mayor (Mr. J. E. Brockhouse), in his reply, speaking of having "turned the corner" meant that the consumption of gas was growing, in spite of the use of up-to-date devices, which have been recommended to consumers for increasing the efficiency of their gas lighting and decreasing their consumption. I can say, without undue egotism, that displays of gas lighting may be seen in West Bromwich second to none in the Provinces.

It is interesting to note in this connection that the position has been maintained in spite of the closing of several large iron-works during the past few years.

HAROLD E. COPP, Engineer,

Feb. 8, 1911. West Bromwich Corporation Gas Department.

The Publicity Campaign.

SIR,—"No little dissatisfaction has been felt in some quarters, and difficulty created in others, because the circulars and accompanying letters were sent to the chairman in every case, and not to the officers of the undertakings."

This little paragraph, which appeared in the "Editorial Note" on the above-named subject in the "JOURNAL" last week, "hits the right nail on the head" at the very outset. As one who has been engaged with the managements both of large and small gas undertakings—including some years with one of the three London Companies—I cannot understand how such an error of judgment could have been perpetrated by those who were responsible for the issue of the circulars. How many of the gentlemen whose names appear on the circular referred to would not have resented such an action as applied to their own undertaking, and as to whose support to the object in view such an action would have been worse than fatal? If I mistake not, powerful and persistent opposition would in some cases have been among the first-fruits resulting.

And there is abundant reason for this in the country as a whole. It is not merely a matter of "personal pride," as the "JOURNAL" leader later on suggests. Business of this nature, proposing to make calls upon the purse of the small provincial undertakings, must, if to be successful in the board-room, be approached with the greatest care and good judgment, supported by such local facts (and, may be, local colouring) as will impress the thoroughly non-technical, and possibly, in some cases at least, not over-businesslike, directors. The only way to secure this essential condition is by a fully effective personal introduction.

With not a small experience of provincial gas directors, I venture confidently to assert that, in very many instances, an appeal such as that conveyed in the circular under review, passing directly to the chairman of the company approached, must meet with a result which is directly the converse of that which would have been arrived at if the appeal had been sent to the same board through the medium of the gas manager; and that, as a consequence, the efforts of the Special Committee have met with worse than a rebuff. They have met with disaster. I cannot give full expression to my surprise that such a patent fact was not fully recognized by the gentlemen already referred to.

The country manager is therefore now faced with a very real difficulty. Apart from any personal consideration—and this is a "tall order" (for the units of the gas profession are as fully human as those of any other)—the scheme is seriously handicapped at the very start by the unfavourable reception, promptly terminating in the "W. P. B.," it has already received at the hands of an unsympathetic chairman. We all know how difficult it is to rehabilitate a proposal into favour, however excellent it may be, once it has suffered the prejudice of rejection. Human nature is here again all against it.

The Special Committee would appear to have been badly advised in another important particular. The scheme is launched and the circular is issued under the auspices of the Institution of Gas Engineers. No fault is to be found with this. But the National Institution does not as yet include in its membership the whole of the gas-managing profession of the country; and no doubt there are in the membership of the District Associations, many men who, for various good reasons, have not joined the Institution, but whose services to the profession are not less valuable than are those of many who have. Particularly is this the case in the connection now under consideration; and there are to be found in the ranks of provincial gas engineers and managers men whose well-known work on gas advertising surely ranks in importance sufficiently to warrant their inclusion in the Committee of Management of this scheme, but who, for some reason or other, do not seem even to

have been consulted. They have nevertheless been subjected to the annoying process referred to in the paragraph from the "JOURNAL" quoted above.

Co-operative advertising, as regards the gas industry, has been before the profession for several years—even before Mr. Goodenough's paper was read at Dublin, and Mr. T. E. Pye's paper to the Southern District Association in November, 1908. But, if I mistake not, it was first given practical shape very soon after the last-mentioned paper was read, in a resolution passed by the Commercial Section of the Association just named. This resolution was referred to the Gas Institution Committee and referred back to the Commercial Sections as a whole, in conference at Leeds; and it was finally put into the hands of the Institution, with the result now commented upon.

My remarks will so far, I fear, be considered in the light of destructive criticism. I will now offer one or two suggestions, the adoption of which would, I believe, go far to retrieve the lost ground.

First.—The Commercial Sections have initiated this scheme, as regards its practical working. They should be taken into conference with the Gas Institution. As at present, many of the very men who initiated and worked out the proposals have, so far, been absolutely ignored, and even bye-passed in favour of their respective chairmen of directors. To remedy this, the Special Advertising Committee should be strengthened by nominees of the District Associations' Commercial Sections. The Committee should also have the power to co-opt on to the Committee any member of the profession whose knowledge and experience they consider may be of service.

Second.—The advertising and other propaganda, as also any communication relative to the scheme, should be distributed—

(A) Directly through the hands of those who will eventually have the local working thereof—viz., the commercial managers of the undertaking.

(B) Through the Commercial Sections of the District Associations (supplementary to the foregoing), at the hands of the respective secretaries, to be brought by them before the monthly meetings of the members.

As to A. If there be any question as to which officer—the manager or the secretary—should be communicated with, send to both. This is obviously a more promising course than to send to neither. It is a slur on an honourable and intelligent profession to suggest that the scheme might be fatally prejudiced by the accidental dispatch of a circular to the wrong officer. But possibly it may be true (I certainly do feel tempted to describe the relations existing between the secretary and the engineer of one of the companies I had the honour of serving for some years—a circumstance which I strongly suspect was not without its influence on the decision of the Special Committee). Advertising is essentially a matter of commercial management rather than pertaining to the technically secretarial work. Hence—except in the case of a very small undertaking employing a working manager only, or when the secretary is also recognized as the general manager—the officer to be approached in a matter of this kind would properly be the manager or the engineer and manager. But, "when in doubt," as aforesaid, "send to both!"

At the time of writing, being away from home, I have not by me particulars of the relative numbers of the gas undertakings of this country as regards the output, large and small. But a short study of a gas directory will show that, important as are the contributions of the large undertakings (and we are all deeply indebted to certain of the largest of these for splendid and effective work generously done in this connection), the number of works of between 50 and 200 millions capacity per annum is so large that collectively they could practically ensure the prosperity or the failure of any scheme like this. And yet this class of undertaking is necessarily most sensitive to conditions such as those I have been describing. They cannot be approached in the manner so far attempted by the Special Committee. The consulting engineer of Westminster, and even of the large provincial centres, cannot accurately gauge the conditions under which many of these undertakings are worked. The *personnel* of their management is, nevertheless, on the whole, excellent, and, if rightly approached, may be depended upon to act in the best interests of their respective undertakings, not unmindful of the industry as a whole.

Finally, new ventures, affording no precedents to guide, are always more or less liable to errors of judgment. But we can only learn by experience; and if the Special Committee will face the problem as it is, and not merely as they may think it ought to be—and as emphasized by your correspondent of last week (p. 366)—if they will not hesitate to take into their confidence those who have put much preliminary thought into the matter, and who have practically worked it up for them, and if, further, they will proceed to propagate and carry out the scheme somewhat on the lines I have sketched out, I have every confidence that better success will attend their efforts to raise the necessary funds. On the other hand, this is a democratic age, and any attempt to run this campaign on exclusive lines is doomed to failure.

A COUNTRY MANAGER.

Feb. 11, 1911.

Income-Tax Allowance for Depreciation.

An appeal by the Hamilton Corporation was heard before the General Income-Tax Commissioners at Hamilton, on the 2nd inst., in regard to the allowance for depreciation formerly granted under Schedule D, but now disallowed by the Assessor acting on instructions from the Board of Inland Revenue. After hearing Mr. Gillespie, the Assessor, on behalf of the Board of Inland Revenue, and Mr. Kirkpatrick (Town Clerk), for the Corporation, the Commissioners stated that they could not ignore the sections of the Acts of Parliament quoted by the Town Clerk, and which were quite clear on the subject. They therefore unanimously sustained the appeal by the Corporation—the amount of deduction on the usual items to be adjusted by the Town Clerk and the Assessor.

The Carron Company have secured the contract from the Glasgow Corporation to supply all sizes of cookers and grillers required by them for the next two years. We believe this is the largest contract of the kind placed out of London.

PARLIAMENTARY INTELLIGENCE.

OPENING OF THE SESSION.

The First Parliament of the present King was opened by Royal Commission on Tuesday, the 31st ult.; the State ceremony being performed on Monday last week by His Majesty, when, as customary, he read the Speech from the Throne.

The first business in the House of Commons was the election of a Speaker; and the Right Hon. James William Lowther, who had filled the position in the preceding Parliament, was again chosen for the office. The House was mainly occupied during the week in swearing-in members, and then adjourned till the 6th inst.

Last Tuesday, the Speaker laid on the Table a report that, in accordance with the Standing Orders, Lord Balfour of Burleigh, acting for the Chairman of Committees of the House of Lords (Lord Onslow), who, on account of ill-health, is unable to undertake the duty, and the Speaker's Counsel (Mr. Ernest Moon, K.C.) had a conference to determine in which House the respective Private Bills should be first considered; and they decided that the following should originate in the Upper House:—

Ashborne and District Gas Bill, Barry Railway Bill, Chapel-en-le-Frith, Chinley, and District Gas Bill, Chesham and District Gas Bill, Chester Water Bill, City of London (Various Powers) Bill, Ely Rural District Water Bill, Enfield Gas Bill, Harrogate Corporation Bill, Hastings Corporation (Water and Finance) Bill, Kingston-upon-Hull Corporation Bill, Luton Gas Bill, Luton Water Bill, Merthyr Tydfil Corporation Water Bill, Metropolitan Water Board (New Works) Bill, Oystermouth Urban District Council Bill, Rhondda Urban District Council Bill, Rhymney Valley Water Board Bill, Sidmouth Gas and Electricity Bill, Slough Urban District Water Bill, Swansea Gas Bill, Swinton Urban District Council Bill, Whaley Bridge Gas Bill.

These Bills have all been presented and read the first time.

The following Bills have been presented and read the first time in the House of Commons:—

Bicester Urban District Gas Bill, Blackburn Corporation Water Bill, Chasetown Gas Bill, Chesterfield Gas and Water Board Bill, Chichester Gas Bill, Felixstowe and Walton Water Bill, Gaslight and Coke Company Bill, Gloucester Corporation Bill, Hornsea Urban District Council Bill, Ipswich Corporation Bill, London County Council (General Powers) Bill, Margam Urban District Council Bill, Marple Urban District Council Gas Bill, Paignton Urban District Council Bill, Rotherham Corporation Bill, St. Helens Corporation Bill, Tamworth Gas Bill, Thames Conservancy Bill, West Cheshire Water Bill, Weston-super-Mare Gas Bill, Wirral Water Bill.

Petitions against Private Bills.

Petitions have been presented against the following Bills:—

Chasetown Gas Bill, by the Lichfield Gas Company.

Chesterfield Gas and Water Board Bill, by the Baslow and Bubnell Urban District Council.

Chichester Gas Bill, by the Petersfield and Selsey Gas Company and the West Sussex County Council.

Felixstowe and Walton Water Bill, by the Felixstowe and Walton Urban District Council, the Ipswich Corporation, and the Woodbridge Rural District Council.

Gaslight and Coke Company Bill, by the Corporation of London and the Port of London Authority.

London County Council (General Powers) Bill, by the Metropolitan Water Board.

Margam Urban District Council Bill, by the Aberavon Corporation.

Marple Urban District Council Gas Bill, by the Hayfield Rural District Council.

Paignton Urban District Council Bill, by the Torquay Corporation.

St. Helens Corporation Bill, by the Lancashire County Council.

Tamworth Gas Bill, by the Staffordshire County Council.

Thames Conservancy Bill, by the Port of London Authority, the South-West Suburban Water Company, and the Surrey County Council.

West Cheshire Water Bill, by the Birkenhead Corporation, the Cheshire County Council, the Lower Bebbington Urban District Council, and the Ellesmere Port and Whitby Urban District Council.

Wirral Water Bill, by the Birkenhead Corporation, the Cheshire County Council, and the Wirral Rural District Council.

On Friday, the Warrington Corporation Bill was read the first and second time, and, having been reported and considered last session, was ordered for third reading.

Reduction in Price at Pickering.—At the last monthly meeting of the Pickering Urban District Council, a communication was received from the Gas and Water Company announcing their decision to reduce the price of gas to general consumers by 2d. per 1000 cubic feet; bringing it down to 3s. 2d. In the letter (which was signed by Mr. H. M. Dawson, the Manager and Secretary) it was stated that the Directors considered the public lighting of the town should be improved; and, with this purpose in view, they would be prepared to light all the lamps during the whole of the lighting season without extra charge. This would entail the additional lighting of eight weeks each season without extra cost to the ratepayers. This offer, if accepted, would come into effect with the next lighting season. The Chairman (Mr. F. H. Stericker) thought the Council could not do better than accept the Company's offer. It was, however, decided to discuss the matter at the next meeting.

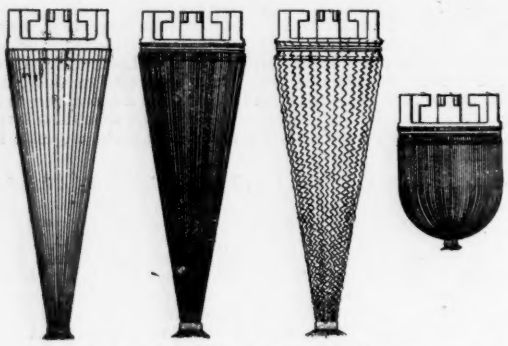
REGISTER OF PATENTS.

Incandescent Gas-Mantles.

ROBIN, J. I., of Tooting, S.W., and WHITE, C., of Randolph Gardens, N.W.

No. 556; Jan. 8, 1910.

This invention has for its object to provide an inverted mantle constructed of flexible filaments by fixedly attaching a number of loose strands or threads to any convenient form of holder and fastening their lower ends together to form a bag-like retainer for the gas-flame.



Robin and White's Incandescent Mantles.

The illustration shows several forms of mantle, also the shape assumed by the mantle after incineration.

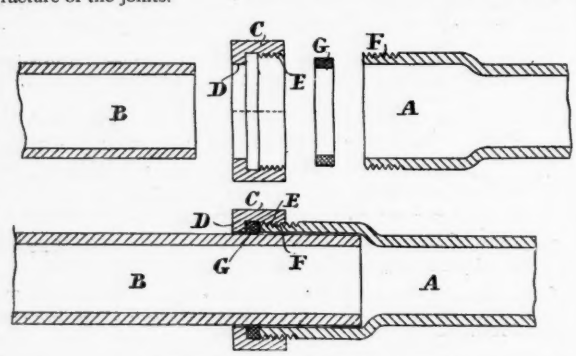
In the first form shown, the threads or strands are secured to hooks or wire projections secured to the mantle-holder. When the threads have been secured to the hooks, the latter are pressed close against the holder; and when the lower ends of the threads are fastened together the mantle is completed. In the second and third forms of mantle, the threads are tied to the mantle-holder by asbestos thread or the like; the impregnated threads in one case are given a folded or zig-zag form by being passed between toothed or corrugated rollers. The threads are preferably splayed out at the bottom, and may in some cases be tied to the mantle-holder in the reverse direction to that shown, and then the mantle is turned inside out.

Jointing Lengths of Metal Tubes and Pipes.

PARKINSON, B. R., and WOODALL, H., of Palace Chambers, Westminster, S.W.

No. 658; Jan. 10, 1910.

This invention relates to the connection of lengths of metal tubes and pipes, each of which is provided at one end with a socket integral with the rest of the section; and it consists in making the sockets of the sections of such size that they will snugly fit the exteriors of the spigot portions of the joints, and in the combination with such sockets and spigots of compressible rings and caps screwing on to the sockets. In this way, the spigots of the joints will be circumferentially supported, but will be free under certain circumstances—such as subsidence of the soil—to yield to a certain extent in the direction of their length without fracture of the joints.



Parkinson and Woodall's Pipe Joint.

A is the socket formed at the end of one of the pipe sections; and B is the other pipe-section, constituting the spigot of the joint and snugly fitting the interior of the socket. C is a hexagonal nut or cap provided with an inwardly projecting lip D, and with an internal screw-thread E adapted to engage with a corresponding thread F formed on the front end of the socket. G is a ring of some suitable packing substance.

In assembling the parts, the ring G is preferably expanded by a mandrel into the back of the cap C, and the latter is passed on to the spigot B, after which the socket A is passed on to the spigot. The socket is held against rotation and the cap C is screwed on to the socket by a spanner. As a result, the ring G will be compressed between the outer face of the socket and the inner face of the cap C, and be forced on to the exterior of the spigot; thus making a fluid-tight joint.

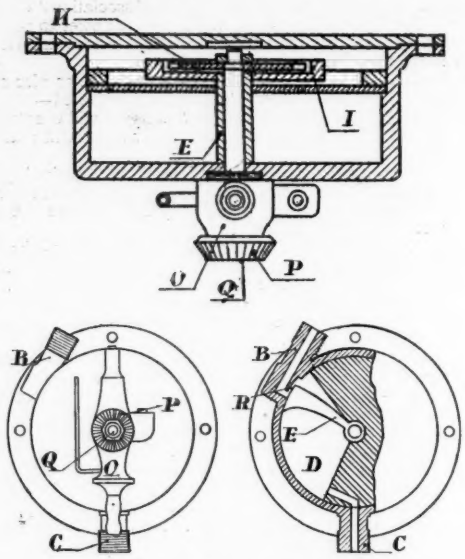
Lighting and Extinguishing Gas-Lanterns from a Distance.

SCHÜLZKE, E., of Kiel, Germany.

No. 991; Jan. 14, 1910.

This invention allows of the operation of a number of lanterns from a central station, and by means of one single apparatus, worked by air or water under pressure.

The apparatus consists (as shown) of a casing having a tubular outlet B and an inlet C. It contains a segment-shaped chamber D, in which is a valve-trap E, pivoted on an extension of the plug of a three-way cock. The valve-trap projects through the plate which closes the chamber D and carries a disc I, having a central cavity in which are pawls engaging with a ratchet wheel K mounted upon the square end of the extension of the plug. The valve-trap E serves for opening and closing the three-way cock O mounted upon the rear wall of the casing. The plug of the cock, which has at one end an extension serving as pivot for the trap, has at its other end an extension Q, carrying the cog-wheel P, by means of which the apparatus can be worked by hand in case the working fluid which generally operates it should fail.



Schülzke's Lamp Lighter and Extinguisher.

The air or water under pressure flows in through the tubular joint C, penetrating into the chamber D, where it shifts the valve-trap E, whereby the plug is turned as the pawls of the disc I engage with the ratchet wheel K. When the trap has reached its highest position, the pressure fluid flows out through the channel R and the tubular joint B. The trap then falls back through its own weight when the pressure fluid is withdrawn, and closes the orifice of the tubular joint C as soon as the pressure in the chamber D ceases. Owing to the trap E in the chamber D (which corresponds to a quadrant of the casing) being pivoted, the cock can be completely opened or closed; both pipes connected with the cock being simultaneously opened or closed, or separately, so that, with proper connections between the several gas-pipes, a certain number of lamps can be simultaneously lighted or extinguished from a central post by means of a single apparatus.

Time Switches for Lighting Circuits.

VENNER, R. F., and GRIESBACH, R. C., of Old Queen Street, Westminster, S.W.

No. 1296; Jan. 18, 1910.

This invention has for its object to practically remove all stress from the moving parts of the clock and to effect the instantaneous opening or closing of the gas-tap "by providing means which travel with the rotary clock-dial, and which enable a constant minimum load to be uniformly stored or accumulated through the action of a stationary cam and through the movement of the clock but entirely external thereof."

Fig. 1 (p. 455) is a view of the whole apparatus; figs. 2 to 5 are taken at right angles to fig. 1, and show the lever mechanism for controlling the gas-tap in various positions. A denotes a clock for timing the actions of the apparatus.

According to the construction shown in these drawings, a stationary stepped cam is fixed to the casing of the clock. It has an internal cam surface with a step B. The arbor of the clock passes through the cam and has fixed on it a plate which carries a pivoted lever C controlled by a tension spring. The lever has a pin kept in contact with the cam surface by the pull of the spring. The cam takes up the variable load of, and the accumulation of energy by, the spring-controlled lever C, and produces upon the arbor of the clock a constant negligible load, which will have no effect on the time-keeping property of the clock, and will not be the cause of time-lag in, or the gradual shifting of, the adjustable dial. The lever is so timed by the stepped cam that slightly before reaching the handle of the tap, the lever is fully deflected against the pull of its spring, and is then suddenly released by the step B of the cam. In jerking back to its initial inoperative position it knocks

sharply against the handle of the tap, and so effects the instantaneous reversing of it.

As the lever cannot conveniently be used for both the closing and opening action, either a duplex device must be provided or the setting pointer of the revolving clock-dial F may be used for one of these actions. For this purpose, the setting pointer is caused to move a pivoted check-lever or pawl G, which retains the handle of the tap in one position against the action of a spring H in such a manner that, on the disengagement of the pawl G through the intervention of the setting pointer E, the tap is instantaneously reversed.

Fig. 1.

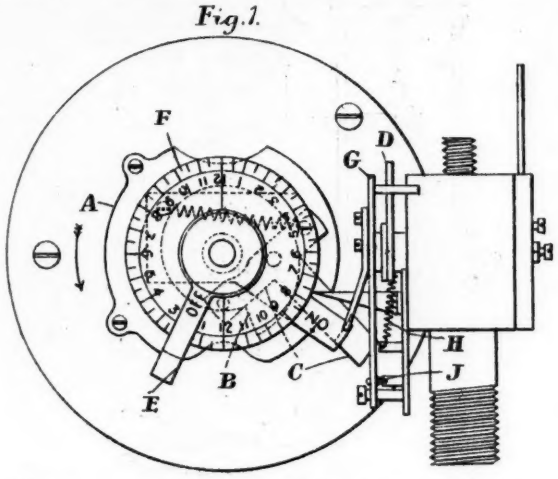
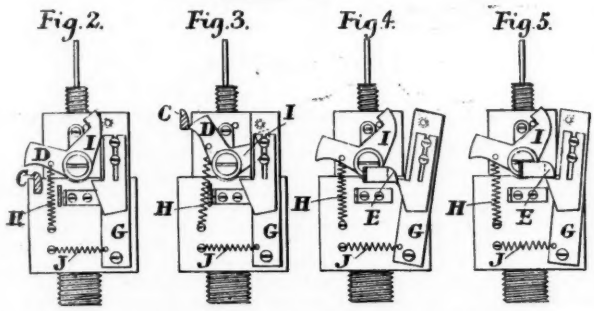


Fig. 2. Fig. 3. Fig. 4. Fig. 5.



Venner and Griesbach's Lamp-Lighting Time-Switch.

For lighting up (say) at 9 p.m., the clock hand "on" is shifted to that number on the rotating clock-dial F, and as the hand is integral with the plate carrying the lever C, the lever will be timed for turning on the gas supply. Presuming the gas is to be cut off at about 2.30 a.m., the setting pointer E is adjusted on the rotating dial F, as shown in fig. 1. As the hand "on" is taken round with the dial, it carries the lever C along; and the pin of the latter follows the internal cam surface, thereby causing the lever to gradually turn in the opposite direction to the dial movement, and so lag behind. At 9 o'clock the lever would be in a position as shown in fig. 1. Then suddenly the pin of the lever would be released by the step B of the cam, and the spring would pull the lever smartly against the lever D of the tap, and so cause it to be jerked from the position shown in fig. 2 to that shown in fig. 3. When the lever C passes away from the lever D, the latter will be retained by a pin provided on the pawl G, so that, for the time being, the gas supply will be kept on. For this purpose, the lever D has an arm I formed with a projection to catch against the pin, and the parts are held in engagement by the action of a spring J attached to the pawl G, which latter turns on a pivot. The lights are kept burning until the pointer E comes round with the dial and strikes against an adjustable inclined piece, and so lifts the pawl out of engagement with the arm I; the latter being pulled by the spring H against a stop. On the escape of the pointer from the incline, the pawl G is caught by the same pointer for the purpose of preventing the pin of the pawl from knocking hard against the tap. This position is shown in fig. 5; and it is only afterwards that the pin comes to rest on the tap. The part. are now in their initial position for the subsequent re-lighting of the lamps

Coke Ovens and Retort Furnaces.

BENNINGHOFF, O., and AUGUST KLÖNNE, of Dortmund.

No. 7704; March 30, 1910.

This invention relates to coke-ovens and retort-furnaces where arranged side by side, with heating flues interposed between them. It has for its object "to prevent the formation of graphite in consequence of the decomposition or dissociation of the gas and the deposit of its carbon on the hot walls of the oven or retort."

To obviate this defect, it has heretofore been usual, the patentees state, to avoid heating the gas space G of the oven or retort K, by keeping the heating flue H below the level of the gas space. Experience has, however, shown that this arrangement is not sufficient to entirely prevent the decomposition of graphite; the heat radiated being often so great that the temperature at which the gas is decomposed is reached in the gas space notwithstanding the construction just described. It has, moreover, been proposed in a retort or oven of different type to enclose the sides of a coking-oven or gas-retort within a shell of boiler-plate—thus providing a water-space that forms a boiler, and not a passage for the constant flow of a cooling medium. And it has also been proposed in an oven or retort of the type to which this invention relates to construct the oven-crown of bricks or tiles having formed within them air-flues that serve the double purpose of heating the air supply and cooling the crowns of the ovens or retorts—several such flues being provided above each oven or retort.

The present invention has for object to provide, in connection with such retorts or ovens, means for removiug the superfluous heat from the gas space of the oven or retort, by providing above it "a single cooling passage of adequate cross section, approximately equal to that of the gas space itself; this passage being either directly supplied with the cooling medium or arranged to serve as a gas outlet, and in the latter case cooled by auxiliary cooling passages arranged on each side of it, above the heating flues."

Fig. 1.

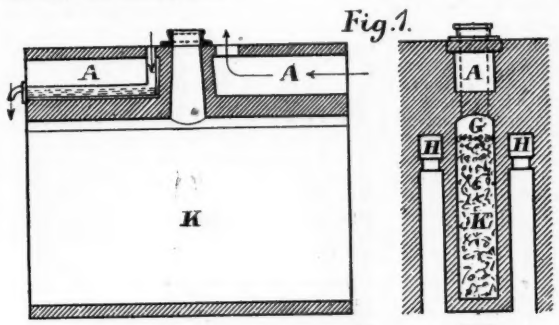
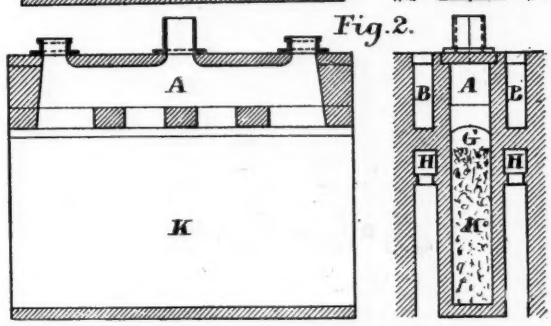


Fig. 2.



Benninghoff and Klönne's Retort-Furnace and Coke-Oven.

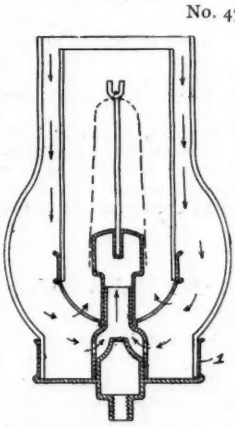
Fig. 1 shows, in longitudinal and transverse section, the former construction of apparatus; while fig. 2 illustrates the latter.

In fig. 1, there is provided above the chamber K a passage A, through which there is caused to flow a cooling medium—for example, air or water. In fig. 2, the cooling passage is adapted to serve as a gas outlet; its lower side being connected directly with the gas-chamber G. The cooling medium in this case passes, not through the passage A, but through the auxiliary cooling passages B, arranged on both sides of it.

Incandescent Gas Lighting Burners.

O'CALLAGHAN, P. B., of Everton, Liverpool.

No. 4723; Feb. 26, 1910.



O'Callaghan's Incandescent Burner.

These incandescent gas-burners are of the type in which the air supply is regeneratively heated by passing down an annulus formed between the chimney proper of the burner and an outer globe.

The suggested arrangement is shown; and—subject to referring in the specification to patents No. 11,106 of 1896, Nos. 793 and 20,756 of 1898, and No. 13,052 of 1899—the patentee is allowed to claim: An improved gas-burner of the bunsen type comprising gas-jets, air inlets to the jets, inner and outer galleries or frames adapted to support inner and outer globes or cylinders respectively—the space between the inner and outer globes being closed to the atmosphere at the base of the burner, and the air inlet to the annulus between the inner and outer globes or cylinders from the atmosphere being only by way of the top of the globes.

Producing Sulphate of Ammonia in Gas Manufacture.

BURKHEISER, K., of Hamburg.

No. 17,359; July 21, 1910. Date claimed under International Convention, July 21, 1909.

This modification of the "Burkheiser" process for the production of sulphate of ammonia was fully described in the course of an article in the "JOURNAL" for Oct. 4 of last year, pp. 23 and 24. The illustration then given is the same as that contained in the specification of the English patent last issued; and the particulars given in the text are, to all intents and purposes, identical.

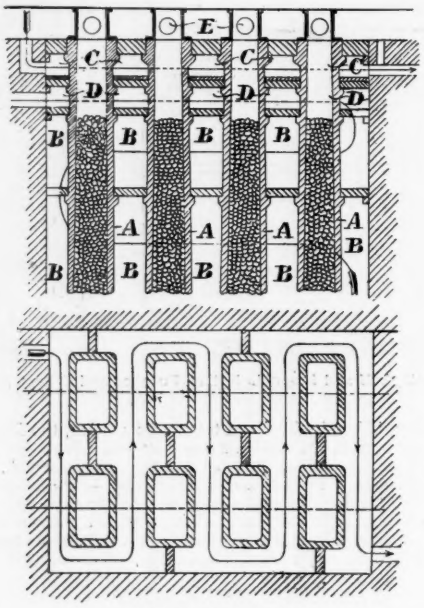
Upright Distilling Retorts.

Bolz, C., of Budapest, Hungary.

No. 17,949; July 28, 1910.

According to this invention, in order to improve gasification and avoid abstracting the heat from the heating chamber, the patentee proposes that a subsidiary flue be interposed between the air-passage and the flues supporting the retorts themselves. The subsidiary flue is maintained at a temperature substantially corresponding to that of the gases which escape from the charge; and the retorts are filled with coal only so far that the surface of the charge is below the level of the subsidiary flue. The air heated within the cooling passage is used for supporting the combustion of the heating gases "in order to render the combustion more economical."

The patentee remarks that, when thus operating the retorts, the gas distilled from the coal cannot take up further heat which would decompose same; and, simultaneously, the advantage is obtained that only a small amount of heat is abstracted by the cooling passage from the flues surrounding the coal charge. The sudden reduction in the temperature of the retorts, which cannot be avoided when the cooling passage is adjacent to the heating flues, is thus avoided. Furthermore, the apparatus provided at the top of the retorts—the discharge pipe, and the upper floor of the battery which is provided with an insulating layer—are not exposed to the high temperature caused by the radiation from the flues as in constructions heretofore in use. The battery "is advantageous also in this respect, that the coking is always effected in a uniform way; while in retorts which are charged to the top the upper parts of the coal are imperfectly coked, and cause the formation of dirty tar, pitch, and similar products."



Bolz's Upright Retorts.

The retorts A extend through heating flues B for applying the distilling heat to the retorts. Near the top of the retorts cooling passages C are provided, "through which a suitable cooling medium, such as air, is circulated." Between the cooling passage C and the flues B a subsidiary flue D is provided. The gas generated within the retorts is withdrawn through discharge pipes E disposed above the upper floor of the battery.

The retorts are charged with coal only to such an extent that the surface of the charge is below the flue D. During the distilling process (which is carried on in the usual way), this flue "is maintained at a temperature which is substantially equal to the temperature of the gases distilled from the coal, so that there is no decomposition of the gases on the surface of heated chamotte."

Connecting Pipes to Water and Gas Mains under Pressure.

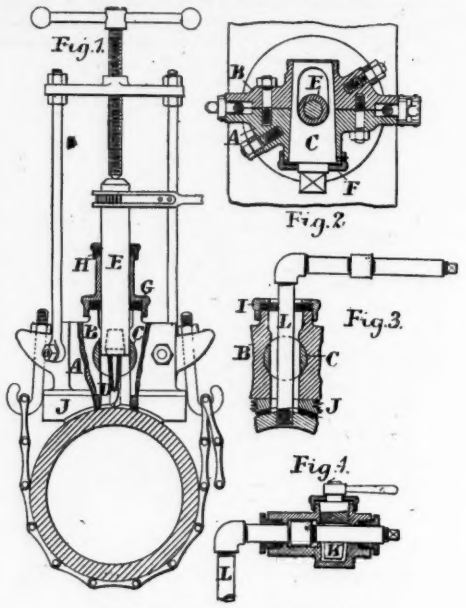
Warren, C. H., of Woodbridge, Suffolk.

No. 19,012; Aug. 12, 1910.

The main object of this invention is to dispense with the use of ferrules and allow direct connection to be made, also for the branch pipe being extended to any distance without shutting off the supply from the main. The drill-box used is provided with a plug valve in the drill passage. It is made in lateral halves adapted to be secured together for use so that, after removal of the drill from the drill-box, a plugged piece of service pipe may be passed through a gland and screwed directly into the drilled and tapped hole in the main, after which the removal of the drill-box may be effected by separating its halves.

The invention also comprises a connecting clamp for use in preventing the escape of water or gas from the end of the service pipe. The clamp is provided with a valve and made in lateral halves; and it is so adapted that when the halves are secured together it fits practically water or gas tight over the ends of the lengths of pipes to be connected, and yet admits of subsequent removal by disconnection and separation of its halves.

Figs. 1 and 2 show the drill-box clamped to a main, and with a drilling and tapping tool mounted in it ready for operation on the main. Fig. 3 illustrates a part of the drill-box with a piece of plugged service pipe passing through it and connected with the main—the pipe being inserted in the box and screwed into the main after the removal of the drilling and tapping tool and other parts. Fig. 4 shows the connecting clamp in section applied to the piece of plugged service pipe and in position for use in connecting a length of service pipe thereto.



Warren's Pipe-Tapping Machine.

The body of the drill-box is made in halves A B, secured together (when in use) by screw studs and nuts. In the body is formed a seat for the conical plug valve C, which may be turned as required to obstruct or open the passage which receives the drilling and tapping tool D and its stock E, advanced or withdrawn by a double ratchet lever. The back-pressure of the tool is resisted by a pressure screw above. The plug valve C is kept in place by a screwed cap F, with leather packing. For substitution for the parts G H in operating with the apparatus as described, a screw cap I (fig. 3) is provided, which cap, when not in use, may for convenience be screwed on the smaller end of the plug-valve seat. J is a separable seating for the drill-box, shaped to fit over the main to be operated on and bearing-on an interposed rubber washer, whereby any escape of fluid from the main at this part, after the hole has been drilled in it, is prevented.

The body of the connecting clamp (fig. 4) is made in halves, secured together (when in use) by studs and nuts, so that between them is a longitudinal passage with a cross seating for a plug valve, through which is a passage K extending to its smaller end, in order that, when the parts are disconnected while a length of pipe is being operated upon (as fig. 4), there may be no obstruction to the removal of the parts from the pipe.

The manner of connecting a wrought-iron service pipe to an ordinary cast-iron main is as follows: The drill-box having its parts A B clamped together is fixed on the main, with the drill stock E and drilling and tapping tool D mounted in the drill box, as fig. 1. A hole in the main is then drilled and tapped by the tool D. After this has been done, the tool and stock are withdrawn clear of the plug, which is then turned so as to prevent the passage of any fluid through it. The tool D and stock and the connected parts are then removed from the body of the drill-box. The parts G H are then removed, and the cap I is secured as in fig. 3, so as to make a tight joint around the service pipe to be connected to the main. A length of service pipe to a socket, on the end of which is connected a short piece of pipe closed by a plug, is then inserted into the passage until it is in contact (or nearly so) with the plug valve C, which is then turned into the position shown in fig. 3. The service pipe is next passed through it and screwed into the tapped hole in the main as illustrated. The cap I is then unscrewed, and it and the packing are removed by passing them over the pipe. The drill-box is then released from the main, and the parts A B are disconnected by unscrewing the nuts. The part B may then be removed laterally from the pipe, and the part A removed by passing the plug valve C carried by it over the pipe which is permitted by the size and shape of the passage in the plug valve—see fig. 2. A length of service pipe is now connected to the end of the pipe L.

As the pressure in gas-mains is comparatively low, the connecting clamp, where gas-mains are to be dealt with, need not be provided with packings and glands, but, instead of a plug valve, the clamp may be provided with a leather faced flap-valve.

Incandescent Gas-Burners.

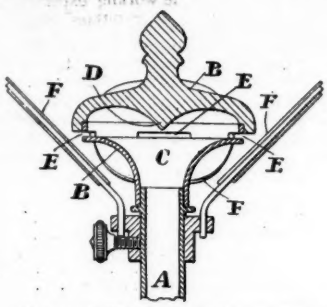
Yapp, W. J., of Kenley, Surrey, and Woods, T. J., of Fleet, Hants.

No. 18,453; Aug. 4, 1910.

The inventors' object is to provide a burner using a plurality of flat incandescent bodies or mantles "which shall give a better light with a smaller consumption of gas than those heretofore proposed."

Upon the tube A (p. 457) of a bunsen burner is mounted a head B, of steatite, in which is formed a chamber C, in the upper portion of which is an inverted cone D co-axial with the tube A. Orifices E deliver the mixture of gas and air on to flat mantles F held between

ring supports similar to those described in patent No. 1531 of 1909 [see "JOURNAL," March 22, 1910, p. 812], carried by a collar secured on the tube A by a set-screw, so that the mantles can be raised or lowered as required.



Yapp and Wood's Incandescent Burner.

The result of having the cone D above the tube A is that the gas is deflected to the orifices E with the minimum loss of velocity. Moreover, the gas in the chamber C is heated by the proximity of the mantles, and there is no throttling of the mixture before it reaches the orifices, and "an exceptionally good light is produced with a very small consumption of gas." Also, by employing a number of mantles, "the light may be evenly distributed or cast in any particular direction, and the shadows reduced to a minimum."

APPLICATIONS FOR LETTERS PATENT.

1683.—SANDERS, L., and SANDERS, REHDERS, and Co., "Analyzing gases." Jan. 23.
1706.—DEUTSCHE HÜTTENBAU G. M. B. H., "Regenerative retort-furnaces." Jan. 23.
1738.—SAFETY NON-EXPLOSIVE RESERVOIR COMPANY, LTD., and PARR, T. D., "Air-gas machines." Jan. 23.
1744.—BOOTH, A. T., "Pipe-joints." Jan. 23.
1779.—HOLLAND, F., "Mantle-holder." Jan. 24.
1823.—SCHERR, J., "Taps and valves." Jan. 24.
1826-7-8.—LYON, H., "Gas-ignition." Jan. 24.
1838.—ANN, P. D., "Cleaning and polishing gas-cooking stoves." Jan. 24.
1847.—MILBOURNE, R. J., and TURNER, J. W., "Gas-retorts." Jan. 24.
1856.—ANDREY, E., "Gas-boilers." Jan. 24.
1869.—KENNEDY-M'GREGOR, J. A., "Gas-meters." Jan. 25.
1872.—SMITH, E. W., and WALTER, C. M., "Heating by high-pressure gas." Jan. 25.
1875.—STOTT, V. H., and SCHOFIELD, L., "Gas-governors." Jan. 25.
2009.—LOWEN, W., "Globe-holder." A communication from F. W. Killing. Jan. 26.
2036.—SKLENÁR, I., "Gas-turbine." Jan. 26.
2042.—WOLF, F., "Manufacturing ammonia sulphite and ammonia sulphate from coke-oven gases." Jan. 26.
2074.—POWELL, J. W., "Fixing gas-brackets." Jan. 27.
2126.—TREEN, J. C., "Self-locking taps." Jan. 27.
2127.—ANDERSON, A. A., "Atmospheric burners." Jan. 27.
2131.—ZECHNALL, L., "Incandescent burners." Jan. 27.
2138.—HUTCHINS, T. W. S., "Gas-producers." Jan. 27.
2151.—EBERLE, K., "Gas-burners." Jan. 27.
2165.—BOSENIUS, H., "Cleansing apparatus for hydraulic gas-mains." Jan. 27.
2169.—BROOKING, F. G. C., "Regulator for taps of gas-brackets." Jan. 27.
2253.—FOLLIET-MIEUSSET, A., "Gas-producers." Jan. 28.
2299.—WILSON, J., "Universal joints." Jan. 30.
2353.—BINGHAM, C. S., and WILSON, T. G., "Joint-making packing." Jan. 30.
2392.—GILL, G. M., and MIDDLETON, A., "Dealing with dust and smoke in connection with charging gas-retorts by machinery." Jan. 30.
2401.—PACE, P. C., "Manufacture of air-gas." Jan. 31.
2468.—HANNING, G., "Gasification apparatus." Jan. 31.
2491.—HILL, A., "Reflector for illumination." Jan. 31.
2539.—HENWOOD, G., "Controlling gas-heaters." Jan. 31.
2551.—GOW, W., JUN., "Pipe-joints." Feb. 1.
2581.—HOLMES, W. C., AND Co., LTD., and HOLMES, E. D., "Washing and scrubbing gases." Feb. 1.
2587.—ANDERSON, D., "Burner regulators." Feb. 1.
2633.—BOCHUMER EISENHÜTTE HEINTZMANN and DREYER, "Levelling the charge in horizontal retort ovens." Feb. 1.
2639.—HOWELL, H., "Inverted burners." Feb. 1.
2653.—KEMP, C. W., "Glass arrangements for surrounding the illuminating portions of gas-fittings." Feb. 2.
2712.—JANSON, L. G., "Producing combustible gases." Feb. 2.
2749.—WATERS, J. C., and GOOD, A., "Gas-meters." Feb. 3.
2807.—EATON, F., "Gas burners and fittings." Feb. 3.
2816.—FALCKE, C. D., and SPIERS, P., "Gas-producer plants." Feb. 3.
2846.—BARNES, W. J., "Globe-holder." Feb. 4.
2859.—BURDEN, J., and PARIS, G. F., "Prepayment meters." Feb. 4.
2892.—RUTTEN, J., "Controlling gas-valves." Feb. 4.
2907.—PANKOW, O., "Lighting gas at a distance by pressure." Feb. 4.

At an extraordinary general meeting of Fuel Gas, Limited, recently held at the offices in Sheffield, a resolution was passed to the effect that the Company should be wound up voluntarily. Mr. C. B. Davies, of Sheffield, was appointed Liquidator.

LEGAL INTELLIGENCE.

LIABILITY FOR PAYING THE "KING'S CLOGG."

In the House of Lords last Thursday, the decision was given in an appeal from the Court of Appeal in an action in which Sir Frederick Adair was plaintiff and the Metropolitan Water Board and the New River Company were defendants, and in which it was declared that, according to the true construction of the Metropolis Water Act, 1902, the annual sum of £400, called the "King's Clogg," was an obligation which was transferred from the New River Company to the Board, who were ordered to pay the arrears of the annuity. By section 2 of the Act, it is provided that, "as from the appointed day, the undertaking of each of the Metropolitan Water Companies shall be transferred to, and shall vest in, the Water Board; and there shall also be transferred from each Company to the Water Board all liabilities with respect to any debenture stock or mortgage debt of such Company, and all other debts, liabilities, and obligations of such Company then existing." The contention of the appellants was that the annuity was never a burden upon the New River Company or its funds or property; and in the Court of Appeal this contention was upheld by Lord Justice Fletcher Moulton. The Master of the Rolls and Lord Justice Farwell, however, affirmed the judgment of Mr. Justice Warrington, before whom the matter came in the first instance. The proceedings in the Court of Appeal were reported in the "JOURNAL" for Dec. 22, 1908 (p. 839).

The appeal to the House of Lords was argued twice—on June 17 and 23, 1910, before the Lord Chancellor, Lord Ashbourne, Lord Macnaghten, and Lord James of Hereford; and last Wednesday and Thursday, before the Lord Chancellor, the Earl of Halsbury, Lord Atkinson, Lord Shaw of Dunfermline, and Lord Mersey. Mr. Danckwerts, K.C., Mr. Cave, K.C., and Mr. A. B. Shaw (instructed by Mr. Walter Moon, the Solicitor to the Metropolitan Water Board) appeared for the appellants; Mr. Rowden, K.C., and Mr. Tomlin (instructed by Messrs. Nicholl, Manisty, and Co.) represented Sir Frederick Adair; and Mr. Buckmaster, K.C., and Mr. Sargant (instructed by Messrs. Hollams, Sons, Coward, and Hawksley) the New River Company.

Without calling upon the respondent's Counsel, the Lord Chancellor gave judgment dismissing the appeal. He said their Lordships were not acquainted with the manner in which the question had been treated in the arbitration with the Water Companies, and were therefore compelled to decide according to the law as it was in the Statute. The Court of Appeal had come to the conclusion that Sir Frederick Adair was entitled to receive from the Water Board this annuity of £400. Before the passing of the Act of 1902, this sum had for generations been paid to him and his predecessors in title by the New River Company. By that Act, the undertaking of the Company was transferred to the Water Board with all its liabilities. If this annuity was a debt, liability, or obligation of the Company, then the decisions in the Courts below were right. There was no evidence which could justify any doubt as to the efficacy of the original charge on the King's moiety of the Company's undertaking; it was a "charge," to use modern language, upon one-half of it. This was sufficient to show that the judgment of the Court of Appeal ought to be affirmed.

Lords Halsbury, Atkinson, and Shaw concurred; and the appeal was dismissed.

MALTON GAS COMPANY'S ASSESSMENT APPEALS.

The North Riding Quarter Sessions, at Northallerton, were occupied for nine hours last Tuesday in considering three appeals by the Malton Gas Company against poor rates, on the ground of over-assessment. The appeals were before the Justices on the 5th ult.; but at the close of the appellants' case were adjourned on account of the illness of the acting Chairman [see *ante*, p. 106]. They were now reheard *de novo* before the regular Chairman, Mr. E. R. Turton.

The area of supply of the Company comprises the parish of Malton, in the North Riding of York, and the parish of Norton, in the East Riding; but both parishes are in the Malton Poor Law Union. The total assessment of the Company's works and mains in the two parishes had been fixed by agreement in 1894 at £1010 gross and £708 rateable. In 1904, an Electric Lighting Company commenced operations in Malton; and in 1909 the Gas Company asked for a reduction in their assessment, mainly on the ground of the competition of electricity and its results. In September, 1909, the Assessment Committee reduced the assessment to £1003 gross and £550 rateable; these figures being accepted as a compromise by the Company, who considered that the reduction ought to have been still greater. In the following month, however, the Overseers and Committee revalued the undertaking at £1683 gross and £846 rateable, distributed as follows: Malton, works and mains, £1516 gross, £739 rateable; Norton, mains only, £167 gross, £107 rateable.

On Oct. 30, 1909, a poor-rate was made upon this increased assessment. On Feb. 12, 1910, the Company gave formal notice of objection; and on April 30 a second rate was made to cover the expenses up to Sept. 30, 1910. Meanwhile the objection was still under consideration till Oct. 15, when the Committee decided against it. A third rate was made on Oct. 29; and a fresh objection was sent in on Nov. 22 and was at once refused. Thereupon the Company gave six separate notices of appeal against the three rates—to the North Riding Sessions as regards Malton, and to the East Riding Sessions with respect to Norton. The East Riding appeals were, however, not "entered," both sides agreeing to accept the decision of the North Riding Sessions as determining the basis of assessment for the two parishes. By agreement, the 1909 accounts of the Company were taken by the experts as the basis of their valuations; and the Court was asked merely to fix the values of the undertaking as a whole—the

parties being content to distribute such figures between the two parishes according to the proportions adopted in earlier assessments.

The Counsel engaged were Mr. G. F. L. Mortimer and Mr. Gerard R. Hill (instructed by Messrs. H. W. & R. Pearson and Russell, of Malton) for the appellants; and Mr. W. C. Ryde, K.C. and Mr. W. R. V. Wragge (instructed by Mr. A. E. B. Soulby, of Malton) for the respondents.

The appeal against the rate of Oct. 30, 1909, was taken first. There proved to be two main points in issue between the parties: (1) In calculating their working expenses and the landlord's repairs, the Company claimed to be allowed a sum for repairs and renewals largely in excess of their average expenditure for the past few years. They stated that stress of competition had driven them to cut down expenses to a very low point, with the result that an incoming hypothetical tenant would have to face at once a very heavy outlay for renewals. (2) The Company claimed to exclude, and the Committee claimed to include, the receipts and expenses of two subsidiary businesses carried on by the Company—a gas-fittings sale business and an asphalting business.

The Engineer and Secretary of the Company (Mr. Henry Tobey) gave evidence as to the history, accounts, and prospects of the undertaking. He stated that when the assessment was agreed to in 1894, the Company had a monopoly, and there was no threat of competition. In 1904, the Electric Light Company commenced operations, with the result that the Gas Company lost the public lighting contract for Malton, which brought in nearly £400 per annum, and had to write off £600 in respect of street-lamps, &c. They also lost the supply of gas for power purposes at the Norton Council's pumping-station, and a great number of private customers—mostly large ones. To make good this loss, the Company had to seek for new customers, who were mostly cottagers. They reduced the price of gas from 2s. 10d. to 2s. 6d. per 1000 cubic feet, and pushed the use of penny-in-the-slot meters and stoves. The change in the class of customers considerably increased the working expenses per 1000 cubic feet of gas; and the amount of tenant's capital in the concern continually grew. Accordingly, in 1909, after facing the competition for four years, they claimed a reduction from the 1894 assessment. Between 1904 and 1909 there had been an infinitesimal increase in the total sale of gas, a decrease in net profits, and an increase in the share attributable to the occupier. In 1909, the Company spent on repairs and renewals £940 in all (at the rate of 4·36d. per 1000 cubic feet of gas sold)—*i.e.*, on meters and stoves, £362; on mains and pipes, £105; and on works and plant, £473. In the "halcyon days," they had spent much more—for example, in 1894 the repairs and renewals were at the rate of 8d. per 1000 cubic feet, which witness considered about normal. Latterly they had cut down expenses drastically, and consequently they must face an abnormally heavy expenditure on renewals during the next few years. He agreed with the experts that about £4500 must be spent very soon on particular replacements. On an average, he considered 5d. per 1000 cubic feet a proper allowance for repairs and renewals to works, plant, mains, and service pipes. The town was not a growing one. The Company already had 1933 meters in use; and as there were only about 2000 dwelling-houses, they had little chance of extending their sale of gas. The Company had accumulated a considerable reserve fund, and paid a regular dividend of 12 per cent. per annum, free of income-tax. They had invested a portion of their reserve fund in purchasing a house separate from the works, and had converted part of it into offices for the gas business proper, and part into a shop where they exhibited and sold outright gasaliers, brackets, stoves, piping, and other fittings. The offices and shop were rated together as one hereditament, separately from the works and mains. The Company also carried on, under a section of their Act, an asphalting business, taking contracts for laying asphalte both within and beyond their gas-supply area. The asphalting business was carried on in a "mixing-shed" (not separately rated) in a corner of the gas-works, and tar, ashes, and clinker were taken from the works; the other ingredients being bought in the market. The accounts of the gas, gas-fittings, and asphalting businesses were kept separate in the books, and were shown separately in the balance-sheets. The salaries and wages of all officers and workmen were properly apportioned between the three businesses; and all tar supplied by the gas-works to the asphalting business was properly debited and credited as between them at market price. It was true, however, that the main business profited slightly by getting rid gratis of a certain quantity of ashes and clinker. Both the subsidiary businesses had to face the competition of tradesmen and contractors. In 1909, the receipts of the two businesses together came to £844, and the expenses to £618.

The following valuation was submitted by Mr. George Humphreys-Davies:—

Gross receipts	£9169
Working expenses	6063
Net revenue *plus* rates	£3106
Occupier's share	1575
Gross estimated rental *plus* rates	£1531
Deduct gross estimated rental *plus* rates of property separately rated—*i.e.*, foreman's house on works and offices, part of the house referred to by Mr. Tobey	21
	£1510
Statutable deductions	918
Rateable value *plus* rates	£592
Rates at 4s. 8d. in the pound	112
Rateable value of works and mains	£480
Add estimated rateable value of the mixing-shed at the works used for the asphalting business and not separately rated	10
Total	£490

The witness therefore put the gross value at £1408, and the rateable value at £490. He explained various items in his valuation as follows: The gross receipts were arrived at by taking the actual receipts for 1909 in respect of sales of gas, sales of residuals, and rents of meters and stoves, and deducting therefrom an average sum for bad debts and a sum in respect of gas sales wrongly credited to 1909, because, owing to accidental circumstances, the reading of customers' meters at the close of the year was delayed for a week. He excluded the receipts for the subsidiary businesses. The working expenses, from which the expenses of these two businesses were omitted, were analyzed under six heads: Manufacture of gas; distribution of gas; public lamps; management expenses; law charges; and tenant's repairs and renewals. The first five of these items were taken from the year's accounts, except that law charges were averaged, and the fire and boiler insurance premiums paid were deducted as being a landlord's expense. The figure for tenant's repairs and renewals, however, did not represent either the actual or an average expenditure, but the sum which witness considered a prudent tenant ought to spend or put aside annually. He calculated it thus—

Ordinary meters in use—			
Cost, *plus* stamping fees, labour in fixing (1s. 6d. each), main taps and pipe connections (3s. each)	£1749		
Repairs, at 2 per cent. thereon		£52	£132
Renewals in 17 years, on 3 per cent. tables		80	
Slot meters in use—			
Cost, *plus* padlocks (1s. 10d. each), labour in fixing (1s. 6d. each), main taps and pipe connections (3s. each)	£1888		
Repairs, at 5 per cent. thereon		£94	227
Renewals in 12 years, on 3 per cent. tables		133	
Stoves (heating and cooking)—			
Cost, *plus* fixing of former (at 5s. each)	£3685		
Repairs, at 5 per cent. thereon		£184	443
Renewals in 12 years, on 3 per cent. tables		259	
Estimated annual cost of repairing tools and loose chattels			179
			£981

The "occupier's share" was estimated by witness thus:

Five months' working expenses—*i.e.*, 5-12ths of £6063	£2526	
Less probable cash receipts from slot meters and sales of residuals	1000	£1526
Cost of meters, stoves, and public lamps in use	£7454	
Less one-fourth for depreciation	1863	5591
Meters, stoves, and lamps in stock		250
Tools, office fittings, &c., less depreciation		400
Photometer and testing apparatus, less depreciation		120
Six weeks' stock of coal and oil		388
Sundry stores		40
Stock of coke and and other residuals		188
One half-year's rates		55
Cash at bank		500
Total (say)		£9000

17½ per cent. on £9000 = £1575.

[A further sum of about £175 was claimed for tenant's time, skill, and capital employed, if the subsidiary businesses were to be included in the calculations.]

As to the "statutable deductions," the witness took 5d. per 1000 cubic feet of gas sold as the average cost in gas-works of repairing and renewing works, plant, mains, and service-pipes. This, on the 1909 sales, worked out at £1077. Some of the plant represented tenant's tools and chattels; and witness divided the £1077 thus: Landlord, five-sixths = £898; tenant, one-sixth = £179. This £179 he had already included under "tenant's repairs and renewals." To the £898 he added £20 for insurances (at 2s. 6d. per cent.); making the "statutable deductions" £918. The total sum £1899) claimed for repairs and renewals of all kinds (landlord and tenant) was at the rate of 8¾d. per 1000 cubic feet. This rate he considered to be reasonable and proper.

Mr. E. H. Stevenson gave evidence in support of the appeal. He approved the preceding valuation, except that he allowed to ordinary meters a life of only fifteen years, and put the repairs thereto at 5 per cent. An examination of the accounts of the South Metropolitan Gas Company for five years [see 1 Konstam, 48, 55], and of the recently published balance-sheets of some twenty companies confirmed his view that the rates of 5d. and 8¾d. per 1000 cubic feet mentioned by the preceding witness were proper and reasonable for estimating allowances for repairs. The division of one-sixth to tenant and five-sixths to landlord was a fair working rule; it was accepted by the Assessment Committee in the South Metropolitan case.

Both of the Company's experts also gave evidence as to the need for heavy outlay on renewals in the immediate future, as to the general effect of electricity competition on gas companies, the greater cost per 1000 cubic feet of supplying small consumers, the increase of tenant's capital owing to the use of slot-meters and stoves, and the decreased profit due to the extra cost of supplying, maintaining, and supervising them.

This was the case for the appellants.

For the respondents, Mr. Wheater Smith, of Bradford, and Mr. G. Renton, a Director of the Harrogate Gas Company, put forward a valuation of a less detailed character than that already given, but based on much the same lines. They put the gross value at £2030 and the rateable value at £1193; but it was understood that when they framed this valuation they did not know that a sum (according to the Company £197) ought to be deducted from the 1909 receipts in respect of gas in fact manufactured in 1910. The statutable deductions of £837 comprised £802 for landlord's repairs and £35 for insurance. The main points of difference were the inclusion of the subsidiary businesses, and the allowances for repairs and renewals. Under this head they allowed the sum actually spent *plus* £370 for depreciation of landlord's works, plant, and mains; the £370 being calculated on a value of £18,000 at a life of thirty years on the 3⅓ per cent. tables. They calculated the occupier's share by allowing different percentages (5, 10, and 17) on different parts of his capital; but both parties arrived at practically the same results on the hypothesis of either excluding or including the subsidiary businesses. Mr. Wheater Smith explained the action of the Committee in September and October, 1909, thus: On

the objection being made to the assessment of £1010 gross and £708 rateable value, he advised the Committee that the undertaking was assessed too low, but that for the moment the assessment could not be raised. [See *Hudson v. Rhodes* (1909), 1 K.B., 85]; that the "statutable deductions" must be at least £800; and that therefore the Company would inevitably succeed, if they went to the Sessions accepting the gross and merely challenging the rateable value. [See *Horton v. Walsall Union* (1898), 2 Q.B., 237]. Consequently, he advised them to make the best terms they could to get out of their present difficulty, and subsequently to revalue the undertaking, putting both gross and rateable values up to the figures which he considered proper.

In the course of the legal argument which followed, the appellants' Counsel contended for the exclusion from the accounts of the receipts and expenses of the two subsidiary businesses. The Company had no monopoly therein. If they were letting their undertaking, they could not give to a tenant more than the "chance" of continuing to earn these profits. In both businesses, they had competition to meet. Shopkeepers selling gas-fittings, and contractors doing asphalting work, would be rated on the rental value of the premises used for the business, and not on the profits of the business; and it would be unfair to rate the Company on their profits. In valuing a railway, the receipts and expenses for "cartage and delivery," in which the railway company had no monopoly, were excluded from the accounts. [See "Ryde on Rating," p. 252; *Great Northern Railway Company v. Hitchin Union* (1906), 1 Konstam, 116.] The analogy was exact. They also referred to the Ipswich case in 1907 [2 Konstam, 699] as supporting their contention. In that case, the fittings were let on hire and not sold. As for the allowance for repairs and renewals, experienced experts had spoken to the sum claimed being a reasonable and proper one for a gas company to spend. If so, the fact that for some years past they had not spent it should not prejudice them. The proved accumulation of renewals waiting to be done showed conclusively that not nearly enough had been spent in recent years.

The respondents' Counsel argued that, in the face of the actual expenditure in recent years, and of the high dividends regularly paid without recourse to the reserve fund, the allowance claimed was absurd. As for the subsidiary businesses, if the Company had no monopoly, they had at least an advantage over competitors, for consumers would naturally go to them for fittings and asphalting work. Tar and cinders were residual products; and the asphalting receipts ought to be treated just like those from coke.

The Court, after a brief retirement, unanimously allowed the appeal, with costs, fixing the gross value of the undertaking at £1408, and the rateable value at £525. The rate-book is to be altered, and any excess of rates already paid refunded. They did not give any express ruling as to the subsidiary businesses; but, as they adopted the exact gross value put forward by Mr. Humphreys-Davies, it seems tolerably clear that they excluded them.

The third appeal (against the rate of Oct. 29, 1910), based on the objection of Nov. 22, 1910, was formally allowed, with costs, on the same figures. But on the second appeal (against the rate of April 30, 1910) being called on, the respondents raised the technical point that the appeal must fail because there was no objection to support it. Reference was made to *Reg. v. Great Western Railway Company*, in 1869 (L.R., 4 Q.B.) and later cases on the same lines, and also to *Rhondda Valley Breweries Company v. Pontypridd Union*, in 1909 (1 K.B., 652), especially to a *dictum* of Lord Justice Kennedy (pp. 674-5).

The Court, after argument, ruled that this appeal must fail on the point taken, but refused costs to the respondents. It is understood that on this point of law another Court of Quarter Sessions has recently given a different decision. Until the High Court has had an opportunity of considering it, ratepayers should be careful to repeat their notice of objection whenever a fresh rate is made, though their first objection is still under consideration.

Sequel to the Manchester Pipe-Line Fatality.

At the Lancaster County Court last Friday, before his Honour Judge Hans Hamilton, a workmen's compensation claim was heard, arising out of the suffocation of William James Thistlethwaite (23), by fumes in the Thirlmere to Manchester pipe-track last September, as recorded in the "JOURNAL" at the time. Mr. T. P. Tilly appeared for the applicant, Mrs. Margaret Thistlethwaite, the mother of the deceased; and Mr. J. T. Sanderson represented the Contractor, Mr. J. Moffatt, of Manchester, who had paid into Court £50, which had not been accepted. Mr. Tilly said the widowed mother was partially dependent upon the deceased, who received £1 per week wages, and practically handed this amount to his mother. At the time of his death, another brother was receiving 8s. per week as an apprentice. It was estimated that the profit on the son would be 7s. 6d. per week, and his brother was partially dependent upon him. Mrs. Thistlethwaite gave evidence, and, in cross-examination, said she had a son at Barrow, but he had not sent her anything since Christmas. His Honour found that the £50 paid into Court was sufficient; and, on his suggestion, Mr. Sanderson said he would not ask for costs.

Cost of Public Electric and Gas Lighting at Cheltenham.—It seems that the action of the Holborn Borough Council in referring back to the Works and General Purposes Committee the report on the public lighting of the borough, noticed elsewhere, has been communicated to newspapers in various parts of the country by means of paragraphs giving the figures of the tenders submitted, but ignoring the fact that other boroughs in the Metropolis have abandoned electric lighting in favour of gas for the public thoroughfares. A correspondent calls attention to one of these paragraphs in a Cheltenham paper, as an example of what is printed whenever an electric light company appear, as in this case, to "score" a success. No wonder, he says, the Corporation of the town continue to spend three times as much on the electric lighting of the public thoroughfares by their own undertaking as they do on the gas lighting. The amount spent annually by the Corporation for lighting about one-fourth of the streets with electric light is something over £9000; whereas for lighting about three-fourths of the town with gas it is roughly £3000.

MISCELLANEOUS NEWS.

WORKSOP WATER PURCHASE ARBITRATION.

The Award.

The award has now been issued in the arbitration which took place last month between the Worksop Urban District Council and the Worksop Water Company, under the Act sanctioning the purchase of the undertaking which was obtained by the Council last year. The price which it has been decided the Council are to pay the Company is £64,612.

The arbitration proceedings (which were conducted before Mr. A. J. Ram, K.C., as Umpire, and Messrs. F. Fowler and E. Willcox as Arbitrators) were lengthy—extending over five days; and as will have been seen from the report which appeared at the time in the "JOURNAL" (*ante*, p. 245), there was a very big difference in the value placed on the concern by the two parties. In fact, the award is about £18,000 less than the amount claimed by the Company, and £16,000 more than the valuation submitted on behalf of the Council.

THE LIGHTING OF CALCUTTA.

New Manager of the Oriental Gas Company.

A copy of the Calcutta "Statesman" just to hand, dated Jan. 24, contains the following lengthy account of gas matters in that city.

At the meeting of the Special Committee appointed to consider and report on all matters between the Corporation and the Gas, Tramways, Telephone, and Electric Light Companies, on Tuesday, Jan. 3, 1911, the Committee were asked to consider the following letter of Messrs. Mansfield and Sons, dated Dec. 20: "In confirmation of our conversation yesterday, we beg to state that we are now willing to complete the concluding arrangements for the supply of the 9000 burners, and shall be glad to receive the contract for our perusal and signature at a very early date. We regret the inconvenience caused by our action in this matter; but, in view of the circumstances, we think our course was justified."

The PRESIDENT, replying to Mr. Tremearne, said that Mr. Mansfield was of opinion that the work of installing the burners ordered could be carried out by May 1. He, however, very much doubted this.

It was resolved that the Committee recommend the Chairman to change the date for the opening of tenders for the mantles and glassware for the Mansfield burners to Feb. 28, and that this be done at once, and copies of the specification dispatched by next mail for advertisement in the English papers and communicated to the leading suppliers in Europe.

The SUPERINTENDENT OF LIGHTING, in reply to Mr. Wyness, said he did not think it possible to complete the work of installation by May 1. They would have to arrange matters with the Gas Company, and there was the important question of obtaining stores. The lamps would be ready; but it was doubtful with regard to burners.

The PRESIDENT said they would have 8000 burners to go on with.

Mr. TREMEARNE said he was convinced that if they kept on with the Lighting Department they would end in one of the biggest messes they had ever been in.

The HON. MAHARAJ-KUMAR RESHEE CASE LAW said it was not the fault of the Department, but of the conditions prevailing.

Mr. WYNESS said they were making very little progress all round. He had for a long time been asking for a monthly programme of work necessary to be completed by May 1. It had not been produced; and he understood it could not be submitted now.

The PRESIDENT said they had got on to a certain extent. They had done something; but the Gas Company had done nothing.

Mr. MANSFIELD was then invited in, and, replying to the President, said, in regard to the possibility of the lighting being ready by May 1, that it all depended on who were going to do the work. If his firm had been doing it, he could have had it all completed in two months. The only thing that interfered with the completion of the work was the Corporation's arrangements as regulated by municipal law.

The PRESIDENT said that under their contract with Messrs. Mansfield they would only have 6000 burners by the first week in May.

Mr. MANSFIELD said the Gas Company would not have pressure for more than 6000 burners by May 1. They were running a boosting main along the main roads, but had not the faintest idea of what was going to happen when they put the pressure on. They had not even got a plan of the mains. When the pressure was put on, it would be effective in certain streets and not in others; and he was certain that 2 inches of pressure would not be obtained for the whole of the districts of Calcutta under twelve months' time. Therefore, even if they fixed 2500 burners a day, as they could do, there would be no difficulty in their coping with the pressure available. Then there was the question whether they should enforce the penalties, which were very heavy, against the Gas Company, for not supplying pressure, or make some arrangement with them. It was a magnificent opportunity for putting in their burners—the Gas Company having been caught at a disadvantage and the Corporation not being completely ready either. But if they allowed the Gas Company to get their pressure ready first, the Company could dictate terms to them. In the first place, they had not got their gas pure, which would give the Corporation trouble with their burners, and also trouble the Company in regard to their governors. The Corporation would never know where they were, and the Gas Company would not know where they were for some time to come. Replying to the President, he said they could get their burners up if they abrogated their Municipal arrangements, and made some arrangement, as an ordinary business firm would, to get a supply of mantles in time.

It was resolved: "That the Oriental Gas Company be asked whether they are prepared to accept a contract for the lighting of the city for a

period of (say) three years, on terms to be subsequently arranged; the burners to be supplied and installed by the Corporation."

Mr. ABADY then appeared before the Committee, and was asked by the President if he would be prepared to advise the Gas Company to undertake the lighting of the City themselves, and whether he could give the Committee any idea what the terms of such contract would be. He said he tried to voice some such idea at the last meeting of the Committee, when the questions of the remission of the fines imposed on the Company were considered. To be candid, it seemed this proposal was by way of helping the Corporation over a difficult situation.

The PRESIDENT said they thought the proposal might be favourable to both the Corporation and the Gas Company.

Mr. ABADY said that, before offering an opinion on it, he would like to have the matter of the remission of the fines settled.

Mr. TREMEARNE said they were making Mr. Abady a business proposition. The question of the fines would come up after six months had passed, as the Corporation wished to see what the Company were going to do in regard to the lighting. As a candid friend, he was bound to say that, up to the present, the Company had left a great deal to be desired. As a matter of fact, things were pretty bad. He would advise Mr. Abady not to proceed with the question of the fines now.

Mr. ABADY said he would like to be equally candid, and he regretted he could not look at the matter of the fines in the same way. He had no shadow of doubt that the deduction of the fines was absolutely illegal. He frankly admitted to the Corporation that there were things in regard to the Gas Company's work which were susceptible of improvement. He had come to the conclusion that the best way to effect improvement was to have a change of management; and was able to help matters forward in that way. He then came to the Committee meeting, stated all this frankly and with the approval of Mr. Mansfield, and then came to the question of the fines. He was in Calcutta trying to get the Gas Company to effect certain improvements for the benefit of the Corporation; and the Company were willing to spend money in doing so. He heard expressions of opinion from the members that the matter really had nothing to do with the Corporation at all. But it was for the Chairman to settle; and he received from the Chairman an assurance that the whole amount of the fines would be remitted.

Mr. WYNES ssaid he thought this remark should be qualified, because his recollection was that the Chairman said that if results were satisfactory, he, on his part, would undertake to say the remission would be made.

Mr. ABADY read the resolution on the subject, and proceeded to say that, on leaving the Committee, he, in accordance with instructions from the Directors, cabled that the fines were to be remitted, and had now induced the Directors to take the steps detailed in his letter to the Chairman. This was done in innocence of any intention on the part of the Committee to go back on their decision. He held Mr. Mansfield responsible. On the strength of the olive branch held out to the Company in case of their doing certain things, he had caused those things to be done.

Mr. WYNESS said that after the resolution arrived at with regard to the remission of any amount in excess of that which would have been imposed for monthly deductions under the former rule, the Chairman went on to make a personal statement that if the Gas Company worked up to the standard required by the Corporation he would consider the remission of the whole amount of the fines. It was rather wrong for Mr. Abady to say he had been misled.

The PRESIDENT said Mr. Abady had apparently not recommended the Gas Company to do anything but what he thought was necessary in order to improve their power for the purpose of meeting the new contract. He could not see that there was any particular concession in that. It was their duty to do it.

Mr. MANSFIELD said, as the Corporation's adviser, he had given the Company the assurance that the fines would be returned at once.

The PRESIDENT said the Chairman, he himself, and, he thought, the members, were under the impression that it was simply a matter for the Chairman, because he had imposed the fines and could refund them. It happened, however, that they were imposed last year, and Corporation sanction was necessary.

Mr. TREMEARNE said the Chairman promised what he could not perform.

Mr. WYNESS moved that the Committee should ask the Corporation to rescind their resolution in view of what had now been pointed out to them, and carry out the Chairman's intention to remit the fines.

It was unanimously resolved that the Committee make a formal recommendation to the Corporation that they rescind their resolution of Dec. 21, 1910, in view of what had now been stated to the Committee, and that they give effect to the Chairman's intention in regard to the remission of fines.

In regard to the proposal that the Gas Company should take over the lighting of Calcutta,

Mr. ABADY said he would like to have some time to think over the matter.

THE COMPANY'S REORGANIZATION.

The Committee were asked to consider the following letter, dated Dec. 29, 1910, from Mr. Abady:

When I had the privilege of attending the meeting of the Gas Committee on Nov. 26, I made the following statements with reference to improvements at the gas-works: "I am going into details with the Corporation expert as to what these steps will be. I think the Corporation advisers will tell the Committee that they agree to the lines I have suggested. I have not, of course, been able to explain these steps fully to the Directors by cable; but I have written fully, and I confidently expect a satisfactory reply by cable when the Board have considered the letter which I dispatched last mail day." Mr. Wyness then asked if Mr. Mansfield agreed *in toto* to what I said; and Mr. Mansfield replied that "he agreed with Mr. Abady absolutely, but he would like to know who was going to see the work of reorganization carried out."

I am now in a position to tell you that the Directors have asked me to see the reorganization properly started, so that I can give the necessary assurances to the Corporation; and I beg to do this by informing you that the Directors have agreed to follow the course I have suggested by taking the following steps:

The present capacity of the gas-making retorts is equal to over 2 million cubic feet daily, or nearly twice the maximum daily demand. The Directors have, however, dispatched two skilled retort-erectors, who will not only supervise the completion of the modernization of the existing retort-houses, but will put down a new house with retorts equal to a daily capacity of 700,000 cubic feet. This plant will be actuated by electrical machinery, and will be valuable in rendering the retort-house operations less dependent upon labour, and the supply of gas therefore more secure in case of labour troubles. The retorts will be equipped also with the most modern tar-mains and governors.

I stated, and your Chief Engineer and Mr. Mansfield agreed, that the apparatus for extraction of tar, ammonia, and general purification was substantially sufficient, but had not been handled with discretion. Nevertheless the Directors have sent out, and are having erected immediately, the following plant: A new annular condenser, a new water-tube condenser; and a cyclone tar-extractor capable alone of extracting the tar from 1½ million cubic feet of gas daily. In addition to this, the existing water cooler and the two Pelouze and Audouin condensers are being rearranged. You will therefore see that the works will be equipped with plant for extracting tar of very much excess capacity, all arranged on the most modern lines. The Directors have also sent out an additional rotary washer-scrubber of a daily capacity of 1½ million cubic feet; and these, in addition to an existing one of similar size and seven tower-scrubbers of a similar aggregate capacity, place the works in possession of ample plant for removing impurities which are extracted by water and liquor—viz., all ammonia and traces of carbonic acid and sulphuretted hydrogen. The question of the arrangement of the water is one which is engaging attention; and I am myself seeing the Chief Engineer of the Corporation regarding a further supply of unfiltered water of suitable nature, and also a supply of filtered water.

The purifying plant, which has enabled gas to be sent out (as the Corporation tests show) without sulphuretted hydrogen, has been, or is being, doubled; while the new Manager, who has had considerable experience in places where natural iron ore is unobtainable, intends to altogether revise the method of working the purifiers hitherto adopted. The sulphur purification results have, however, always been satisfactory.

I would like to point out—and it is clear from the above—that the Directors have adopted the policy of practically duplicating each important part of the plant—viz., the retorts, where the gas is made; the tar-extractors and condensers, where it is condensed and freed from tar; the washers and scrubbers, where it is freed from ammonia, &c.; and the purifiers, where it is freed from sulphur impurity. By this means, a portion of each section of the plant will be able to be put out of use, cleaned, and overhauled periodically—a state of affairs which your Chief Engineer and Mr. Mansfield will readily appreciate.

The Directors have appointed Mr. L. M. Snelgrove as General Manager; and I believe that a gentleman with the experience of Mr. Snelgrove in construction, management, and distribution cannot fail to uphold the obligations of the Directors and the interests of the Corporation and citizens of Calcutta to the fullest extent. A competent Works Foreman and an additional Distributing Engineer are also being appointed, and will shortly take up their duties.

More than 40 miles of mains have been laid during the past year; and new distributing plant has been fixed at the works, and will be operated in a few weeks, so as to enable the Engineer to make any adjustments in the pressure of gas distribution in order to be ready to comply with the terms of the agreement which commences on May 1 next.

I do not wish to raise any matter of controversy; but in making the above full and voluntary statement in order to let your advisers know what steps the Directors are taking in accordance with my pledge, I feel I ought to make it perfectly clear that the question of the details or manipulation of their coal-gas plant is not one about which the Directors have entered into any contract with the Corporation. I feel sure, however, that the interests of the Corporation, which are well defined by the new agreement, will always be borne in mind by the Directors, and can, indeed, be measured during its 20 years' term by constant application of the various clauses thereof.

I shall be obliged if you will enable me to take home to the Directors a letter saying that you are satisfied with these assurances, and the news that the remission of fines kindly promised by you has been effected. And they will, I am sure, further be glad to know that, when the Manager makes application to you for the remission of the balance remaining, you will also have seen your way, in accordance with your promise, to have given the necessary authority for its repayment.

Mr. ABADY said he would like, upon this letter, to have from the Committee an expression of opinion as to the *bona fides* of the Gas Company in regard to the efforts they were making to carry out the contract.

The PRESIDENT said they could hardly make an official expression of approval, and their opinion would not carry much weight in such a matter. They would have to go on the advice of their expert, and could only express satisfaction.

It was resolved that the above letter be recorded, with an expression of satisfaction on the part of the Committee.

AGREEMENT ACCEPTED.

At the Meeting of the Special Committee on Friday, Jan. 13, it was resolved that the Committee recommend for acceptance the proposed agreement with the Oriental Gas Company for fixing burners, lanterns, &c., and lighting, extinguishing, and maintaining the public lights in Calcutta, subject to a few alterations.

Mr. ABADY asked that the matter should be settled at the next meeting of the Corporation.

Mr. TREMEARNE said it might be dealt with at a special meeting which could be summoned to precede the meeting of the Corporation on the Wednesday following the next meeting.

The Committee accepted this suggestion, and then adjourned further consideration of the matter.

THE GASLIGHT AND COKE COMPANY.

The One Hundred and Ninety-Eighth Half-Yearly Ordinary General Meeting of Proprietors was held last Friday, at the Chief Office, Horseferry Road, Westminster—Mr. CORBET WOODALL (the Governor) in the chair.

The SECRETARY (Mr. H. Rayner) read the notice convening the meeting; and the seal of the Company was affixed to the Register of Proprietors.

REPORT AND ACCOUNTS.

The GOVERNOR: Ladies and Gentlemen,—The proprietors will no doubt desire that the half-yearly report and accounts (copies of which were posted to them on the 30th ult.) be taken as read. I have now pleasure in moving—"That this meeting do agree with and confirm the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 30th ult." The accounts are prepared in a form so simple and clear that they call for little explanation, especially when the result is so satisfactory as in those now before us. In comparing the figures with those of the corresponding half of the preceding year (a comparison is made for you on the revenue and net revenue accounts), it is necessary to bear in mind that the price charged for gas was reduced at the commencement of 1910, and that on this account the revenue is less by some £50,000 than it would otherwise have been. This same circumstance had to be reckoned with in the two preceding years, and will be next year; but it is none the less necessary to bear it in mind now. The account period has been a favourable one for the Company. As you will see, we have had to pay more for our coal; but that is practically the only unfavourable item. The trade of the country has been good, and London has had its share of prosperity. Partly because of this, our business has increased. We have sold 3 per cent. more gas. Oil has cost us less; and the prices obtained for all residuals have shown increases, and the working expenses have been reduced.

Looking at the accounts in detail, it will be seen that the net addition to capital expenditure has been £36,074. The sum actually spent was £99,642; and this was reduced by £63,568 on account of necessary depreciations, especially of stoves and meters. The capital account stands now at £598 per million cubic feet of gas sold; and the charge for dividend and interest is 11·31d. per 1000 feet. Five years ago, the figures were £661 and 12·33d. During the past year, the capital was reduced £20,000 by the operation of the redemption fund created by the Company's Act of 1903. In the current year, the contribution to this fund will be increased by £10,000—making the total £30,000. Because the redemption fund must be provided out of the divisible profits of the Company, the increased dividend, which would otherwise have been 2s. 8d. per cent., can only be 1s. 4d. per cent. for the current year. So long as the price of gas remains at 2s. 7d. per 1000 feet, the dividend will be £4 14s. 8d. per cent.; when a further reduction is made, and the price is 2s. 6d. per 1000 feet, the dividend will be at the rate of £4 17s. 4d. per cent.

INCREASED OUTPUT.

Turning to the revenue account, it will be seen that there has been spent on coal and oil, £602,600, as against £606,700 in the corresponding half year. The revenue for gas in the same period was £1,648,200, which compares with £1,648,160 last year. It is remarkable that, on a revenue so large, the difference should be only £40; and it is more surprising when we remember that there has been delivered to the consumers an added quantity of 368 million cubic feet of gas in the half year—sufficient to supply the needs of an important city. The reduction of 3 per cent. in the charge for gas is balanced by an increase of like percentage in the quantity sold. The Company lost by reason of the reduction in price £50,000; but the rental nevertheless is £46 more. The agreement in cost of raw material is almost as striking; the difference being £2360 on a total of over £600,000. The increase shown in meter-rents is due to an adjustment of accounts only. I explained six months ago that part of the extra rate charged to prepayment consumers is now credited to meter-rents, instead of being carried wholly to the credit of "rental of stoves and fittings." It will be seen that the latter item is less by £15,000 in consequence. Coke, tar, and ammonia have realized £67,000 more than in the corresponding half year; and the net cost of raw materials is better therefore by £69,000. Carbonizing wages are slightly less, although the quantity of gas made is so largely increased. Purification is a heavier charge, because we have felt it desirable to increase the quantity of lime used. Repairs of works continue to absorb a large sum, and will do so for some time to come.

RECONSTRUCTIONS.

The No. 12 retort-house recently reconstructed at Beckton is one of the largest extant, and is yielding admirable results. The cost of making gas there will be as small as any of which I know. The whole work reflects great credit upon Mr. Thomas Goulden, the Chief Engineer. The reconstruction at Stratford has been equally successful. Another retort-house at Beckton will be completely refitted this year, as will also one at Bow Common. At Nine Elms, three obsolete houses will be replaced by one of at least equal capacity. It is clear that the engineers are to have a busy time.

DISTRIBUTION AND HIGH-PRESSURE SUPPLIES.

There has been an increase of £50,000 in the cost of distribution. This is due chiefly to the rapid growth in the number of meters, stoves, fires, and fittings which have to be maintained in a state of efficiency, and partly to special expenditure arising out of the conversion of a large number of public lamps to the system of high-pressure supply. The same observation applies to the item of public lamps, on which there is an increase of £7000.

FAVOURABLE PROSPECTS.

The credit balance on revenue account is better than that at December, 1909—good as that was—by £28,000. The balance of net revenue, after meeting all the preferential charges, is £1,033,209. From this, the Directors propose to transfer £20,000 to the insurance fund, to make the usual contribution of £10,000 to the redemption fund, to pay the maximum authorized dividend of £4 13s. 4d. per cent., and to carry forward to the next account the balance of £625,688. The total reserves of the Company are now £950,000, comparing with £433,000 five years ago. Looking forward, the Directors see no reason for anxiety. The revenue in the current half year will suffer to the extent of another £50,000 by reason of the further reduction in the price of gas which we were able to announce from the 1st of January last; coal will cost us a little more than in the period under review; and there will be slightly more to provide for dividend. We have, however, had in the year closed a considerable balance over what has been required for dividend; and I think it improbable that we shall have to reduce our balance in order to meet this year's dividends. Each of the alterations I have referred to will add to the efficiency of our plant, and cheapen the cost of production; and I therefore look forward with confidence, not simply to maintaining the present price, but to further reducing it before long. So much for the accounts.

CO-PARTNERSHIP *v.* SLATE CLUBS—THE CO-PARTNERSHIP MAGAZINE.

A few other matters call for observation. I am glad to say we are content with what we see of co-partnership in operation. Thrift in working men takes various forms; and the peculiar attraction of slate clubs shows that systematic temporary saving up, which is not the same thing as real saving, has a place in working-class economy which does not exist elsewhere. Unfortunately, these sharing-out clubs are much exposed to the risk of defalcation on the part of the temporary officials entrusted with the unaccustomed handling of other people's money. There were several such robberies last Christmas; and the circumstance of some of our own men having suffered in this way has led the Directors to offer to take charge of the deposits of slate clubs formed by the Company's employees, on which interest at the rate of 4 per cent. per annum will be allowed. The Directors accept no responsibility for the management of the clubs, but only for the safekeeping of their money. An interesting development of co-partnership this half year has been the starting of a magazine—which is published monthly—at the price of one penny, and is entirely written by the co-partners themselves. It is intended to record the domestic affairs of the Company and the co-partnership, and thus to form a bond of fellowship among the 9000 odd scattered members of this body. It is hoped and believed—from the warm welcome accorded to the first numbers of the magazine—that it will become extremely popular, and will help to deepen and strengthen that *esprit de corps* which is so characteristic of the Company's staff.

IMPROVED PUBLIC GAS LIGHTING.

Installations of improved gas lighting—using the inverted burner—have recently been completed, or are approaching completion, in Westminster, Bethnal Green, Finsbury, Hackney, Lambeth, and Southwark. The high-pressure inverted lamps which have been supplied to the City of Westminster for the improved gas lighting of Victoria Street, Whitehall, Aldwych, and Kingsway, and to take the place of electric arc lamps in Pall Mall, Piccadilly, Regent Street, and other West-end thoroughfares, constitute a striking exhibition of efficient street illumination by gas, and have been the subject of very general approval. Contracts have recently been concluded with the boroughs of Chelsea and Paddington for new inverted burner lamps throughout their districts; while negotiations are still in progress with several other of the many street lighting authorities comprised within our area. It is hoped that before the end of this year the lighting of London streets by gas will compare favourably with the lighting of any other city in the world. As shareholders are aware, the lighting of the streets of Marylebone and Hampstead has been changed from gas to electricity—solely, as I believe, because the electric light supply is in the hands of the municipalities; but I do not think a comparison between the lighting of the streets in these two boroughs and that of the streets in which inverted gas-burners have now been installed will be considered, by any unprejudiced party, as anything but favourable to gas.

PORT OF LONDON.

Speaking from this place nearly three years ago, I expressed the satisfaction with which the Directors contemplated the establishment of the Port of London Authority, and the prospect of material improvement to the port. The shareholders doubtless read in "The Times" lately a statement by Lord Devonport, the Chairman of the Authority, in which was set out a programme of works proposed to be carried out—including some new docks. "The Times" published an excellent map illustrating this statement. One of the proposed docks is shown as occupying part of the lands belonging to the Company at Beckton. Should the scheme be finally approved, your Directors will put no obstacle in the way. We have, in fact, already agreed with the Authority the price at which the land will be transferred. The construction of such a dock will bring about a considerable development of the neighbourhood; and by it we shall profit—first through the increase of population and demand for our products, and, secondly, by the enhanced value of our surplus lands.

SURPLUS LAND AT KING'S CROSS.

I am glad to say that the abandoned works at King's Cross, except the portion occupied by gasholders, has been sold to the Great Northern Railway Company at a price which the Directors consider satisfactory. The station is now dismantled and the old plant either re-used elsewhere or sold.

VISIT OF GERMAN ENGINEERS.

In the month of October, a large party of German Engineers visited England upon the invitation of the Institution of Gas Engineers and were the guests of the Company at Beckton and elsewhere. These gentlemen expressed, in very cordial terms while in England, and after

their return to Germany, their appreciation of the friendly welcome extended to them.

THE LATE SIR JOHN AIRD.

Since our last meeting, death has removed, in the person of the late Sir John Aird, one who had long held a foremost place in our industry. He was for fifteen years a Director of this Company, a position which he valued not least among the many distinctions offered him. Those who knew him well will treasure his memory not only because of the great works which he constructed at home and abroad (especially in Egypt), but for the singular kindness and thoughtful amiability which endeared him to troops of friends. I now beg to move the resolution which I have already read.

Mr. ULICK J. BURKE (the Deputy-Governor) seconded the motion.

SHAREHOLDERS' REMARKS.

Mr. F. H. PILLEY was sure he voiced the feeling of the proprietors in expressing their very high appreciation of the manner in which the Company was now being managed. They were particularly indebted to the Governor for the very able manner in which the absorption of the West Ham Gas Company was executed, and also for overcoming the difficulties which were experienced in Parliament in the passing of the Bill. The acquisition of these works gave the Company an outlet for which they had been looking for many years. Their boundaries were circumscribed; but by the acquisition of the West Ham works, they now had an outlet on the other side. To what extent this would grow, no one knew. He believed it was the best scheme that the Company had in recent years carried through. He should also like to praise the energy and ability of the General Manager, Engineers, and other officers of the Company.

Mr. C. E. JONES asked whether it was not possible in the revenue accounts to show the rates and taxes separately. The enormous, alarming—he might almost say terrific—march of local rates was not shown clearly in the accounts without comparison with other revenue accounts. He thought it was desirable that local rates should have a line by itself, and taxes also. Westminster was a well-ordered city, and the best lighted in the world, thanks to the operation of the Council and the Board; but the rates were advancing there notwithstanding the excellent manner in which its public affairs were administered. The cause was largely due to the demands of the County Council. If the Board would not mind giving the extra line, he should be very pleased indeed if it was possible to do so without disarranging the accounts. While on his feet, he should like to pay a tribute to the officers of the Company for the excellent manner in which they had converted the old-fashioned gas-lamps into something which was quite a cheering sight to see. The question of municipal trading was largely operating in favour of the electric light, where the authorities were the owners of the undertaking; but where they were not, there could be no two opinions as to the superiority of gas, especially for the diffusion of light in the public streets. It was a great safeguard to have the streets so much better lighted than they were some years ago; and he congratulated the Board upon the manner in which the work had been done, as it was highly creditable to all concerned.

THE GOVERNOR'S REPLY.

The GOVERNOR: Referring to the remarks of Mr. Jones, I may say that the item appearing under the head of "rates and taxes" is practically all rates. Sometimes there is a credit, and sometimes a debit from taxes. What appears there is the difference between the amount paid to the Government and recovered from the shareholders. There would be no point in making a severance between the two. I am glad to hear Mr. Jones speak so favourably of the public lighting, and I am sure he is only voicing the opinion of all unprejudiced people. I have to thank Mr. Pilley for his kindly reference to the officers of the Company.

The resolution was then put and carried unanimously.

THE DIVIDEND.

The GOVERNOR: The Secretary will now read the minute of the Court of Directors recommending dividends for the past half year.

The SECRETARY then read the Directors' minute of Jan. 19, 1911, as to dividend.

(1) That the sum of £10,000 be set aside out of the divisible profits of the Company for the half year ending on the 31st day of December last towards the redemption fund, in accordance with the provisions of the Company's Act of 1903; and

(2) That a dividend as follows for such half year be declared—viz.:

On the 4 per cent. consolidated preference stock, at the rate of £4 per cent. per annum.

On the convertible 5 per cent. preference stock, at the rate of £5 per cent. per annum.

On the 3½ per cent. maximum stock, at the rate of £3 10s. per cent. per annum.

On the ordinary stock, at the rate of £4 13s. 4d. per cent. per annum.

Subject to deduction for income-tax.

The GOVERNOR: I beg to propose the adoption of these recommendations.

Mr. ULICK J. BURKE seconded the motion, which was put and carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR: I now have much pleasure in proposing the re-election of Mr. John Miles as a Director of the Company.

Mr. ULICK J. BURKE seconded the motion, which was carried unanimously.

The GOVERNOR: I have now great pleasure in proposing the re-election of Sir Hugh Owen, G.C.B., as a Director.

The motion was seconded and unanimously carried.

On the motion of Mr. J. REESON, seconded by Mr. G. E. P. HODGE, the retiring Auditors, Mr. John Allen Stoneham and Mr. John James Walker, were unanimously re-elected.

SALE OF LAND.

The GOVERNOR: I have now to apply to you for permission to sell the land to which I have already referred. The site in question is that upon which, until the year 1904, gas manufacture was carried on at St. Pancras, and which, as I have already said, has been sold to the Great Northern Railway Company. I may remind you that up till 1904 this was a very important station of the Company; but the manufacture carried on there was very expensive. The coal had to be brought largely by rail, and the general expenses were heavy, and we did not see our way materially to reduce them. The land that we are selling is that which was occupied by the manufacturing plant. I need hardly say we retain the land upon which the gasholders stand; and it will continue to be a distributing centre of some importance. The closing of the works, and substitution of other works at Beckton, has been a very material advantage to the Company financially. I beg to propose the resolution.

Mr. ULICK J. BURKE seconded the motion; and it was carried unanimously.

Extraordinary Meeting.

At the conclusion of the ordinary meeting, an extraordinary meeting was held for the purpose of considering the Bill which the Company are promoting in the present session of Parliament for the purpose of acquiring the undertakings of the Barking and the Chigwell, Loughton, and Woodford Gas Companies.

The SECRETARY read the notice convening the meeting, and also the heads of the Bill.

THE PROPOSED AMALGAMATIONS.

The GOVERNOR: In moving that the approval of the proprietors be given to the Bill which has been read, I have little to say that will not be a repetition of the explanation I offered two years ago when submitting the Bill for the absorption of the West Ham Company. The purchase of the undertakings of the Barking Company and the Chigwell Company is but another step in the same direction, following the same policy. The passing years find London—the London over which we have rights of supply—more completely occupied, and the area for growth more circumscribed. The districts of the two Companies with whom our agreements have been made are extensive; the rate of increase in the business done is satisfactory; and the distributing plant has been wisely and liberally designed. Gas making will be discontinued at each of the manufacturing stations; but the gasholders will, for a time at least, be kept in use. The capital of each Company in relation to the business done is high; but the heavier charge for dividend which this entails will be more than compensated by the lower cost at which the gas will be made at Beckton. Upon the business which accrues from year to year, the profit will, of course, be greater. The price of gas in the new areas will not at once be assimilated with that of the Gaslight and Coke Company. For two years after the day appointed for transfer, the price of gas to ordinary consumers in Barking will be 2s. 9d. per 1000 cubic feet. In Chigwell, for two years the price will be 3s. per 1000 cubic feet, and for a further two years 2s. 10d. In both areas, the price of the gas used for public lighting will, for two years, be 2s. 6d. per 1000 feet, and afterwards the same as in the area at present supplied by the Gaslight Company. These prices, while securing to the consumers in the new areas a substantial reduction upon the charges now made, will yield to the Company a balance sufficient to cover the costs incident to the adjustment of the supply and other expenses. I explained two years ago that the Company had a very large amount of manufacturing plant unemployed. Though the demand for gas which we have to satisfy is now about 1280 million cubic feet per annum in excess of what it was at that time, we have to-day a margin as large as then. All our reconstruction work has added to the capacity of the plant dealt with; and the quantity of gas made per ton of coal is also much greater. The new areas will require at present about 314 million cubic feet annually; and this quantity will barely be noticed at Beckton. We look for large increase in the future. The West Ham amalgamation has proved an unqualified success; and, on the terms arranged, the new scheme should be equally beneficial to all parties interested. Clause 34 furnishes an excellent new application of the parable of the mountain in labour which produced a mouse. Many an Act of Parliament gravely affecting the weal of the country has contained fewer words than that clause, and yet its purpose is simply to enable us to compel the closing of an account of £130. This item has a line to itself in the capital statements Nos. 1 and 3, and its dividend is set out in solitary majesty in statement No. 5. Section 36 incorporates a clause in the Model Bill which is prepared as a guide to draughtsmen of Gas Bills. It enables the Company to form a fund, called the special purposes fund, to provide for reconstruction of costly plant, such as gasholders or retort-houses, and for the removal of works from one district and their re-erection in another, costs which are too much to be dealt with in the ordinary repairs and maintenance account of any individual year or half year. For instance, when we abandoned the works at Haggerston, St. Pancras, and Pimlico, the amount of capital that was surrendered meant a very considerable sum indeed; and it had to be provided for by a special provision in the Act of 1903. The formation of this fund, which will enable us to put by a considerable sum, will really be a suspense account in advance; so that we shall not be tempted to leave these things in the capital account because we are not able to deal with them in the individual years they are carried out. I do not think there is anything further in the Bill calling for special reference; but if any shareholder wishes more information, he will ask the question. I beg to move:

That the Bill now submitted, intituled a Bill to authorize the acquisition by the Gaslight and Coke Company of the undertakings of the Barking Gas Company and the Chigwell, Loughton, and Woodford Gas Company, to confer further powers on the Gaslight and Coke Company, and for other purposes, be and the same is hereby approved, subject to such alterations as may be made in the Bill by Parliament, and approved of by the Directors.

Mr. ULICK J. BURKE: I have great pleasure in seconding the resolution.

A SHAREHOLDER'S REMARKS.

Mr. C. E. JONES asked what was the parliamentary area of the two Companies proposed to be added.

The GOVERNOR: About 45 square miles.

Mr. JONES said it must be very gratifying to the shareholders to find they had such an expansion.

The resolution was carried unanimously.

VOTES OF THANKS.

Mr. H. D. ELLIS said it was his privilege to be permitted to move a hearty vote of thanks to the Governor, the Deputy-Governor, and the Directors, and also a special vote of thanks to the Governor for the very lucid, able, and interesting speech which he had delivered. It was most interesting to hear the Governor upon gas matters, and the proprietors must have enjoyed listening to him. Their enjoyment would not be lessened by looking at the accounts and seeing what admirable accounts they were. It was a delicate matter to praise anyone to his face, and if he once began to do so, he was afraid he should overstep the bounds of moderation. He thought the Directors, or, as he might term them, their generals, had waged a most successful campaign during the half year. It must make many other Boards of Directors envy them their position. His memory went back far enough to remember the time when the fortunes of the Company were very different from what they now were. The element of luck was very slight in their prosperity now; but this was most emphatically due to the able management of the gentlemen who now controlled the Company.

Mr. J. B. COULSON seconded the proposition, which was put and carried unanimously.

REPLIES OF THE GOVERNOR AND GENERAL MANAGER.

The GOVERNOR: Ladies and Gentlemen, I thank you for the vote of confidence in us you have passed. We are pleased to be able to put before the shareholders so excellent a report as we have done to-day. When speaking of those to whom the credit is due for this work, I look round me and see the many who have been our lieutenants and helpers; and I say the admirable manner in which our officers have worked together with those under their control has had much to do with the success we rejoice in. The Engineers of the stations control the men under them so as to make their work happy and comfortable; and I feel that we are greatly indebted to them. I refer also to the General Manager, the Secretary, the Chief Engineer, and the Controller, for the admirable services which they have rendered to the Company; and I ask you to give them a hearty vote of thanks.

A SHAREHOLDER seconded the motion, which was put and carried unanimously.

Mr. D. MILNE WATSON (General Manager): I thank you very much for the hearty way in which this vote has been moved and passed by the proprietors. There is no greater pleasure to me than to hear such words from the Governor, and to know that we have the confidence of the shareholders and the Board.

PRICE OF GAS AT DEVONPORT.

Sir Joseph Bellamy on the Disadvantages of Municipalization.

A lively and interesting controversy has been carried on at Plymouth and Devonport during the past week over the price of gas in these towns, and the advantages and disadvantages of municipalization of public services. It arose out of the well-worn topic of amalgamation. Most of the leading men in Plymouth are advocates of the union of Plymouth, Devonport, and their neighbour East Stonehouse into one municipality. On the other hand, Devonport people—or at least those who represent Devonport opinion in the Town Council—are strongly opposed to amalgamation, and lose no opportunity of asserting the independence of their town and its ability to run alone. When putting this aspect of the case at a public gathering recently, the Town Clerk of Devonport (Mr. R. J. Fittall) drew some comparisons between the public services of the two towns, and incidentally asserted that, light for light, electricity in Devonport was cheaper than gas in Plymouth. This he contended had been demonstrated by the recent tenders for the lighting of the principal streets of Stonehouse.

This brought into the arena Sir Joseph Bellamy, the Chairman of the Plymouth and Stonehouse Gas Company, who, in a letter to the local newspapers, proceeded to controvert Mr. Fittall's statements. He pointed out that public lighting by gas has competed with and beaten electric lighting in many towns where gas is much higher in price than it is at Plymouth and Stonehouse. "May I ask Mr. Fittall to explain," added Sir Joseph, "how is it that his Electricity Committee can beat Plymouth gas at 1s. 8d. per 1000 cubic feet in Stonehouse, while apparently it is unable to beat its own municipal gas at Devonport, which is 2s. 6d. per 1000 cubic feet? If the public lighting at Devonport can be done cheaper by electricity than by gas at our price, surely it is his duty to recommend the entire lighting of Devonport to be done by the electrical undertaking, and so save a large amount of money to the Devonport ratepayers. Or is it possible the electric light was to be supplied to the Stonehouse people for less than is charged to those of Devonport?" As an addition to these pertinent questions, and by way of a parting shot, the Chairman of the Plymouth Gas Company added that if the Devonport Corporation, after buying the gas undertaking, had invited the Plymouth Gas Company to supply the gas at Devonport, it could have been done from Plymouth at a saving of £15,000 a year to the Devonport consumers. The craze for municipal trading was, however, so strong that he doubted if an offer to supply gas from Plymouth for nothing would have been discussed.

Mr. Fittall replied to Sir Joseph Bellamy's letter by quoting the tenders submitted by the Devonport Corporation and the Plymouth Gas Company for public lighting in Stonehouse; the prices being per lamp per annum, and the Corporation's prices presumably for the district in which electricity mains are laid. Mr. Fittall added that "these figures speak for themselves" and "as the question is simply one of fact and not of argument, I decline to enter into the many side-issues raised by Sir Joseph, which have nothing to do with the statement I made." Sir Joseph Bellamy's rejoinder was to point out that Mr. Fittall's figures have only relative value. "The question is what light does a 75 or a 150 candle power electric lamp give as compared with a gas-lamp of the same power in a given position. The Stonehouse District Council very wisely invited both lighting authorities to put up samples of their respective lamps in certain areas. This was done, and it was evident to an impartial person that the electric lamps fitted to the tramway standards, which are only on one side of the street, lighted that particular side only; but the shops and pavement on the opposite side were badly lighted. This was a case where cheapness meant inferior results. Therefore my argument holds good, that our gas-lamps of the same candle power on both sides of the street gave a far cheaper illumination, light for light." Referring to Mr. Fittall's avoidance of the question why, if electricity is so much cheaper, it is not more used for lighting Devonport streets, Sir Joseph proceeds to suggest a reason. The Electricity Committee, he imagines, have discovered that the cheapness or dearness of gas depends upon the quantity made; and they fear that if their competition resulted in a diminution of the demand for gas, and a consequent rise in the price of the poor man's light, the places of some of these gentlemen in the Town Council would be vacant after the next election.

Alderman Tozer, the Chairman of the Devonport Gas Committee, then took up the challenge, or at least that part of it which immediately concerned his department. Speaking at a meeting in Devonport, he quoted Sir Joseph Bellamy's statement that Devonport could have saved £15,000 a year by inviting the Plymouth Gas Company to supply it with gas. If, said Mr. Tozer, that was true, the Corporation of Devonport had made a great mistake. But was it reasonable to suppose the Company could have supplied gas at a price which would have made this saving? It would have meant that gas would have been sold at a very much less price than the Plymouth Gas Company were charging their consumers. If the offer had been made, however, the Corporation would have refused it because they knew that their own undertaking, under proper management, would eventually give them gas as cheap as, if not cheaper than, Plymouth had it. Mr. Tozer went on to point out that the purchase of the gas undertaking cost the town nearly £150,000, and there had been great additional outlay on reconstruction, on which they had to pay interest and provide a sinking fund. Last year they had made a gross profit of £21,600—a sum which would have enabled a company owning the works to pay a dividend of more than 7 per cent. The Corporation had to pay £18,100 as interest and sinking fund; while the net profit of £3500 was absorbed in the payment of old accounts. He had every confidence that at the end of the present financial year they would be able to reduce the price 2d., if not 3d., per 1000 cubic feet. By means of improvements which were now being carried out, they were assured that they would be able to lower the price by 2d. more at the end of another year. In the third year, certain loans on which they were paying £4000 per annum would be paid off. This meant that they would reduce the price a further 3d., which would bring it down to 1s. 11d. Plymouth was a considerable way ahead of them, but it must not be forgotten that in Devonport the charges for interest and sinking fund were equal to 6d. per 1000 cubic feet on the price of gas, that if they came down to 1s. 11d. it would really be equal to 1s. 5d., and that in course of time the undertaking would be free of these charges, and there would be a magnificent sum to go to the relief of the rates.

Sir Joseph Bellamy replied to this speech in another letter, in which he remarked that it would have been perfectly easy for the Plymouth Gas Company to have delivered gas to the Devonport Corporation in bulk; and the increased output which the Devonport consumption would have brought about at the Plymouth works would have materially lessened the cost of production. Not only would Devonport have been able to save £15,000 a year and a large portion of the £150,000 additional capital outlay, but the Plymouth Gas Company would have been able to still further lower the price to the consumers of Plymouth and Stonehouse.

IPSWICH PUBLIC LIGHTING.

Reduction in the Price of Gas.

At the Quarterly Meeting of the Ipswich Town Council last Wednesday, the Paving and Lighting Committee reported that the last contract between the Council and the Ipswich Gas Company for lighting the street-lamps terminated by effluxion of time on Dec. 31, 1910. The Company having given notice that the price of gas to the general public would be reduced 2d. per 1000 cubic feet on the 1st ult., the Council were entitled to a reduction in the price charged for the street-lamps (assuming that the hours of lighting remained the same, and also that the charges for lighting, cleaning, and extinguishing, and interest on capital where columns, &c., belonging to the Company remain unchanged) as follows: For lamps fitted with ordinary "C" burners, the columns and lanterns of which belong to the Corporation, from £2 16s. per lamp per annum to £2 13s. 6d. For the like, where the columns and lanterns belong to the Company, from £2 17s. per lamp per annum to £2 14s. 6d. For lamps fitted with No. 7 Kern burners, from £5 7s. per lamp per annum to £5 1s. 6d. For high-pressure burners, from £5 7s. per lamp per annum to £5 3s. Subject to the approval of the Council, the Committee had arranged for the Company to light, for two years from Dec. 31 last, all the street-lamps, except the 24 which are now lighted electrically, at the prices above mentioned—power being reserved to the Committee to take out of the operation of the contract, on giving one week's notice, such and so many lamps (not exceeding 50 in each year) as they may think desirable with the view of their being lighted electrically, with power also, on giving similar notice, to again bring such lamps under the operation of the contract for the whole or part of the contract.

Mr. Pipe, the Chairman of the Committee, explained that the 2d. reduction would mean a sum of £228 a year. The Electric Lighting Committee had asked them to withdraw a number of lamps from the gas contract, so that they could replace them with electric lights. The Committee had agreed to withdraw a hundred lamps in two years.

The report was adopted.

The Stirling Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for four more through arches and settings of eight horizontal retorts, with Brooke's patent regenerators, complete with hoppers, coal-handling plant, &c. This is an extension and the completion of the scheme started by Messrs. Dempster in 1908.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER (the Chairman) presiding.

The SECRETARY (Mr. F. M'Leod) read the advertisement convening the meeting, and the minutes of the last ordinary general meeting; and the Register of Proprietors was sealed.

The CHAIRMAN: I have to move—"That the reports and accounts now presented be received and adopted, and the report entered on the minutes." Ladies and Gentlemen—A copy of the report has been sent to every shareholder; and I presume you will, as usual, take it as read. It is now my duty to move its adoption by this meeting; but, before doing so, I desire to amplify in greater detail the particulars of the half-year's working to which the report draws attention.

THE FINANCIAL RESULT.

The financial result is expressed in a nutshell by the first paragraph; and its essential fact is that we have had to pay £22,690 more for our coal than we should have done at the price ruling a twelvemonth previously. What has been the cause of the increase? Generally speaking, it is the law of supply and demand which governs the price. When trade is brisk, or there is any shortage of production, prices have a tendency to move upwards; while, if business is dull, or there is a plethora of stocks, the movement is in the other direction—producers competing for the available orders. Had the law of supply and demand been operative in the present case, we should be paying not more, but less, for trade requirements were less heavy, and the price would undoubtedly have fallen.

THE COAL MINES ACT.

But it has been the Coal Mines Act, and nothing else, which has been responsible for the advance. It is generally understood that the miners in Durham and Northumberland, from which counties our supplies are mainly drawn, did not want the Bill—their leaders even spoke against its adoption. But the bait offered for its acceptance was the general federation throughout the country of those employed in the coal-mining industry; and the coal trade has been in a more or less unsettled condition ever since the Act came into operation. At one of the best-equipped pits in Durham supplying this Company, the rioting was so serious that the manager had to barricade himself in his house, where he was besieged by strikers, who burnt down a recreation hall erected for their benefit by the owners, as well as other stores and buildings, doing damage to the extent of something like £8000. And the more recent case of the Welsh riots, in which a gallant band, with the manager at their head, kept the pit machinery going against long odds, is fresh in your recollection. I may remind you the Act provides that adult men are allowed to work, not as long as they like, but for a period not exceeding eight hours on any day; and if they work longer, they will be summoned to appear at the Police Court for breaking the law. I have used the word "work," but that is not quite accurate. The eight hours is reckoned from the time the pitman starts on his journey from the surface, down the shaft and along the workings, to the place where he is employed, until he has re-traced his steps and re-ascended the shaft. The average time he is actually at work in the mine is about 6½ hours. The Act was passed to placate an agitation which, certainly as far as Durham and Northumberland were concerned, was not based upon the existence of an honest grievance. Well, ladies and gentlemen, the Act set the seal upon the federation of the coal-workers in the United Kingdom; and the necessary outcome of that is a federation of the mine-owners themselves. I cannot blame them for this retaliatory action in the protection of their business and the defence of their interests; but I fear that the last persons who will have any consideration in the matter are the coal users themselves. In our case, it is the poor consumers of South London who are the real sufferers, and who have had to provide the bulk of the money necessary to meet these increased charges. So much for the Coal Mines Act. I am sorry to have had to refer to it at such length; but it was necessary to do so in order to explain why we had to spend so much more upon our purchase of coal.

AN INCREASED BUSINESS.

It is more pleasant to turn from matters of that sort to our own special working; and the first thing I desire to mention, and which is a matter for congratulation, is that our business has increased as compared with the corresponding period of last year. The increase in gas sold during the past half year was only a small one of 0·78 per cent.; and when you remember that the corresponding figure twelve months ago was over 4 per cent., I think you will agree with me that the result is satisfactory. The good increase (nearly 3 per cent.) we had in the Michaelmas quarter was neutralized by the absence of winter weather before Christmas, which explains the reduction in the average figure. It may be interesting to mention the fact that in the last ten years we have more than doubled the number of cooking-stoves in use, and the number of fires. Another satisfactory feature of the accounts under review is the return for residuals. Of these, coke is the most important; and we have made better in quality and quantity, and have sold at a better average price, while less has gone abroad. We are doing all we can to popularize its use; and among other methods by facilitating its sale in small quantities packed in paper bags—an idea we owe to our American cousins. Last year we sold 460,000 of these bags, and last month the quantity reached 177,000.

COKE *versus* COAL FOR STEAM RAISING.

In his address to the Sanitary Inspectors' Association last week, the President, Sir James Crichton-Browne gave some credit to the gas companies for the great reduction in the number of fogs, though all the newspapers did not quote his remarks to this effect. There is no doubt that the good effected by the gas companies has been an enormous one, and would have been greater but for the counteracting influence arising from the increasing number of power stations. In the substitution of electric for horse-drawn tramcars, 140,000 tons of coal are consumed in a year by one station alone of the London County Council, who might certainly entertain worse ideas for the betterment of the Metropolitan atmosphere than the use of coke for their steam raising. We have been told that this fuel is unsuitable for use in marine type boilers; but the Company's three tugs burn coke successfully with slightly increased furnace-room, and the last one built (named the "Partnership") is one of the most useful craft of its kind on the river.

OTHER RESIDUALS.

Tar has maintained its returns, despite a somewhat dull market which has depressed values. Its principal product is pitch; and the improvement we have been able to effect in our make has strengthened our position with buyers on the Continent, by whom it is largely used for briquette making, and quality is an important feature. America is still our principal customer for creosote, and will doubtless continue so for some years yet to come. Timber is required there very largely for railway sleepers; and the engineers, feeling the shortage of timber due to increased consumption and too generous tree-felling, are more freely creosoting to prolong its durability. Our yield of ammonia last year was the highest we have had; and it fetched good prices. A great deal of money has been spent in renewing the storage tanks and pumping machinery for handling it at our largest works, where the plant had become somewhat out-of-date from the present-day standpoint; and the overhaul will be completed during the current half year.

THE MAKE OF GAS PER TON.

Perhaps the most satisfactory feature of the working results has been in the make of gas, which exceeded 12,000 cubic feet per ton—a figure reflecting great credit upon the carbonizing department. The return issued by Lord Rayleigh, the Chief Gas Examiner, shows that quality and purity have not been sacrificed in obtaining this high result. In the latter respect we have set ourselves a higher standard; and the increased charges under the head of purification are a result of this policy, which I am sure is the right one. Wear and tear charges have been exceptionally high; but the half year has had to bear the brunt of more than usually heavy repairs, chiefly pertaining to carbonizing plant and gas storage. Well, ladies and gentlemen, so much for the manufacturing part of our business; and ten or a dozen years ago your Chairman's task would have finished when he had dealt with it.

THE SELLING DEPARTMENT.

During the interval, an entirely new organization has been evolved out of the old distribution department, not less essential to the welfare of the undertaking, and which may be called the selling department as distinct from the manufacturing. Well, our expenses in this respect show no signs of diminishing; but this we can say—that your business in South London was never more firmly established, nor stood higher in the opinion of the consumers, than it does to-day. I think it is a really wonderful result that our business should have changed from a monopoly to a highly competitive one, not only unaccompanied by any loss of its prosperity, but growing in stability and security year by year. The public require much more from us than formerly; and we have moved with the times in satisfying their requirements. A new staff has been brought into being to deal with the many duties which have to be fulfilled, and the ever-extending problems which have to be solved. Not only business knowledge, but scientific and mechanical knowledge as well, have been brought into operation; and the instruments which science has placed in our hands have been of not the least valuable assistance to us. Foremost among them I must place the inverted gas-burner, the use of which is extending rapidly among all classes of consumers. It approaches more nearly than any other form to an ideal source of illumination, having more or less the form of a suspended incandescent hemisphere radiating light rays in every direction from the horizontal downwards. The peculiarity of the construction of the mantle, by which it is carried without contact with the burner, enormously increases its shock-resisting power. The inverted burner also remedies in an admirable manner the objections urged against the use of mantles owing to their fragility. A very good illustration of this fact is afforded by an inspection of those used for express train lighting, and which undergo a journey from (say) London to Edinburgh without apparent loss of light or substance. The burners are made in various sizes, and lend themselves to decorative, as well as effective, shop or domestic lighting. When higher units of light are required—say, from 500 to 5000 candle power—their use with gas under higher pressure is becoming increasingly popular. No London streets can show so magnificent an exhibition of lighting as the leading ones of Westminster; but for the present, I think that South London will be content with the more useful, though not such an imposing, arrangement of less powerful units placed at more frequent intervals, by which means the lighting is capable of more even distribution. The requirements of shopping districts are, however, very different from those of residential ones; and for these, good lighting is one of the best advertising media. An association of shopping interests at Streatham, having obtained the consent of the local authority, provided themselves, through this Company, with an installation of 173 high-power inverted gas-lamps to light their premises and footways from dusk to 9 or 10 o'clock; and their enterprise has been in every way a success. Smaller installations have been put up in Lewisham; and others are in preparation for various parts of the district. High-power gas was selected in competition with other proposals. Its steady, brilliant effect has fully justified its adoption; and it is greatly admired. Turning now to another branch of our business—gas for cooking and heating—I have already stated that there has been a substantial increase in the number of stoves and fires at rent, to which must, of course, be added the not insignificant number purchased outright by the consumers. So much for distribution; and I think I have said enough to show you that it is in a thoroughly healthy and up-to-date condition.

CO-PARTNERSHIP AND EMPLOYEE-DIRECTORS.

The next paragraph of the report deals with the co-partnership which unites the flesh and blood of the undertaking in earnest endeavours to promote its interests. The Board considered the completion of the

21st year of our co-partnership a convenient opportunity to remind the shareholders how long it had been established, and of the large sum paid by way of bonus in addition to the wages earned. No relationship between employer and employed could be happier than that which exists to-day between the Company and its large staff. I lately had occasion to hold some meetings of men engaged in different sections of the staff, in order to take advantage of their experience and suggestions in arriving at conclusions on some matters we were debating. The good fellowship shown by all, and the general interest in the prosperity of the Company's affairs, were demonstrated in a very sincere and pleasing manner. I think, ladies and gentlemen, as shareholders, you will agree with me that, whether in this or any other company, one of the most important duties the Board can be called upon to perform is in deciding what candidate should have their support in filling any vacancy which may happen to arise in it. But in the case of three of your Directors who sit at this table, they have no choice whatever; their election being entirely in the hands of the Company's employees. Well, owing to retirement of one of these, an election recently took place to fill the vacancy; and the candidate chosen was quite unknown to any one of the colleagues with whom he was to sit, including myself. I mention this to show you how perfectly free from influence and fair the election was. Yet, if I had searched the whole Company through, I could not have found a gentleman more suitable for the position than the one chosen, and who I shall shortly have the pleasure to introduce to you. I think it would be difficult to adduce higher testimony to the good sense and the discrimination of working men than they have themselves provided in their choice of a representative. We were very sorry to lose the services of Mr. Austin, who has been an eloquent supporter of the principles of co-partnership, and wherever he has gone has carried his convictions with him. The world of labour is still restless in Great Britain, as it was 21 years ago. One day the trouble is with miners, another with railwaymen, and then with printers, and so on. Failure was prophesied for our co-partnership by statesmen, by manufacturers, and by Trade Unions; but, in my opinion (and I speak with knowledge and deliberation), labour troubles will never be cured until the workman is taken into partnership with, and given the opportunity for participating in, the management of the undertaking in which he is employed.

THE RESOLUTION.

The concluding paragraph of the report relates to your Directorate, and it laments the death of our colleague and valued friend Captain T. B. Heathorn. The Captain was very popular with all the staff; and his insight into character and shrewd common sense had many opportunities for exercise at the counsels of the Board. Owing to the fact that his decease was quite recent, it was not found possible to arrange for the vacancy to be filled at a special general meeting held on the same day as the present one; but one will be summoned later on for this purpose, of which due notice will be given. I have now to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. JOHN MEWS said he had much pleasure in seconding the motion.

The CHAIRMAN: Before putting it, I shall be very glad to answer any remarks made by any shareholder on the accounts or matters pertaining to them.

POSITIONS OF SLOT AND ORDINARY CONSUMERS.

A SHAREHOLDER said, though he was only a small proprietor, this did not prevent him taking a keen interest in the welfare and prosperity of the Company. He was very pleased to see the able reports submitted each year; but he would like to deal with one little question, and that was with regard to the two classes of customers of the Company. They had the ordinary meter customer and also the "slot" meter customer; and, looking at one of the reports about six years ago, he found that the increase of slot customers was something like 85,000, or over 50 per cent. On the other hand, the ordinary customers showed a considerable decrease of no less than 6800 odd during the same period. He wished to say a word on behalf of the slot consumer. There was no doubt that when the prepayment meter came into operation there were so many applications for the installation of the system that the consumers were, to some extent, treated in a rough-and-ready manner. He thought the time for this sort of thing was past, and that the slot consumers were entitled to as much consideration as ordinary customers.

Mr. G. HOWLETT said, after the statement they had just listened to, he thought the meeting would be glad to hear from the other side. He had a large circle of acquaintance with the slot-meter system, and he could assure the proprietors, from his own personal knowledge of 150 slot-meters in houses, that the universal testimony of the tenants was that the utmost attention was paid to their requirements. His (the speaker's) testimony was that more scrupulous carefulness was not possible to be shown to slot-meter consumers. The slot system was being cultivated very largely, and it was appreciated by the people using it; and his own opinion was that the most scrupulous attention was paid to them.

THE CHAIRMAN'S REPLY.

The CHAIRMAN: If no other question is asked, I will reply to the criticism made with regard to the slot-meter system. I do not profess that we carry on our business without complaint or cause of complaint; and I know perfectly well that we never shall. But I do know this, that complaints which have a reasonable basis are very few and very far between. We quite realize the important factor the slot-meter consumer is in our total business, because something like one-third of our gas is supplied through this medium. A great many customers who have dealt with us a good many years were so impressed with the advantages of the new system that they turned over to it. They asked us to supply, and we have supplied, them with gas through slot instead of through the ordinary meters. This is perhaps as effective an answer, although an indirect one, as I could make to the criticism that has just been made; and it also answers the question put as to the reduction in the number of our ordinary consumers. It is because they are so pleased with the facilities and the convenience of the slot meter. I may say, too, that we fully realize that in the matter of slot-meter consumption we have to move with the times. We are moving with them, and are giving the slot-meter consumer a great deal more for his money than we did when we began. We began by giving him a flat-flame burner and a simple stove. We have improved the stove, and instead of the ordinary flat-flame burner we have, in many cases, provided him with an incandescent burner. More recently still, owing to the strides made in the matter of inverted burners, we are fitting many of the slot-meter supplies with inverted burners; and we have under consideration a scheme for increasing these burners in future. I think you will agree with me that the foundation, accurate as undoubtedly it is, of the remarks which one speaker made is a very small one. I may give you other evidence of the appreciation in which our efforts to meet the requirements of the slot-meter consumer are held. I have already referred to the meetings I had with the men on this particular business. We have somewhere about 140 men whose sole duty it is to collect from the slot-meters. What they are interested in is the consumer having the best value for his money, and also, of course, being satisfied with the collection on the occasion of his regular call. At one of these meetings, I asked what was the feeling among slot-meter consumers with regard to what they paid for their fittings—and you must remember that what they pay is not only for fittings but for the hire of the meter and the stove as well. I may go even a step farther than that and tell you that Parliament exhaustively inquired into the cost of this slot-meter undertaking, and they gave us the right to charge 10d. per 1000 cubic feet to pay for the extra cost; but we have only charged 9d. When one takes these facts into consideration, one sees that the slot-meter consumer has not been unfairly treated in any way. Our object is to hold the balance equally between all classes of consumers, and to deal fairly and honourably by all of them, whether they are small or large; and, as far as it is possible to do so, we have faithfully and loyally carried out this desire. I do not think I need take up your time with this matter any longer; and I will now put the resolution to the meeting.

The resolution was carried unanimously.

THE DIVIDEND.

The CHAIRMAN: I have to move: "That a dividend at the rate of £5 9s. 4d. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." I can truly say we have carried out our obligations honourably to the consumers and to the public; and I am sure we can with perfect satisfaction, feeling that we have thoroughly earned it, take the dividend which is proposed.

Mr. NEWBOLD, in seconding the motion, said he endorsed every word the Chairman had said. It was through co-partnership, no doubt, that they enjoyed such a unique position. He assured the shareholders that, as a working man and as the employees' representative upon the Board, they had as contented and as good a body of workmen as could be found in the country. Through co-partnership conferring such benefits upon them, the only wonder was that it did not more widely extend. He conscientiously believed that, if this principle were acted upon more generally, there would not be so many strikes and lock-outs, with their attendant misery. He assured the proprietors that they would never regret spending the money which had been spent on the co-partnership scheme.

The resolution was then put and carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITOR.

The CHAIRMAN: The next resolutions are those pertaining to the election of the retiring Directors. I will take them separately, and the first name I have to propose is that of Mr. Robert Morton. He is the "father" of the Board; and no one could, by the prudence of his counsels or the sagacity of his judgment, be better fitted to hold that position. His almost unique knowledge of gas affairs is of the greatest value to this undertaking. I beg to propose: "That Mr. Robert Morton be re-elected a Director of this Company."

Mr. JOHN MEWS seconded the motion; and it was carried unanimously.

Mr. ROBERT MORTON: Ladies and gentlemen, I thank you for this renewed expression of your confidence in me. I take it that it indicates your opinion that it has been deserved; and I will endeavour to deserve it still further.

The CHAIRMAN: The next resolution I have to propose is: "That Mr. John Ewart be re-elected a Director of this Company." His admirable business capacity is joined to a geniality of temperament which has endeared him to all his colleagues; and there is no one among us in whose opinion we should place greater confidence, or on whom we could more fully rely for a just and impartial judgment, than our friend Mr. John Ewart.

Mr. JOHN MEWS seconded the motion, which was carried unanimously.

Mr. JOHN EWART: I am very much indebted to the Chairman for the kind words used in proposing my re-election; I only wish they were deserved. I thank you very heartily for reposing this confidence in me once again.

The CHAIRMAN: The next resolution is with regard to the auditorship, and that must be moved by a shareholder.

Mr. GEORGE HOWLETT: I have great pleasure in proposing: "That Mr. George Maughan Footner be re-elected an Auditor of this Company." He has been an Auditor for many years; and he has done his work well. He is part of the co-partnership scheme; and, while a workman does his work well, we never part with him till disabled. We could not possibly do better than re-appoint Mr. Footner.

Mr. HARPER seconded the motion; and it was carried unanimously.

The CHAIRMAN: That concludes the business of the meeting.

VOTES OF THANKS.

Mr. L. ROSTRON proposed a hearty vote of thanks to the Directors for their able management of the Company's affairs during the past six months; and the motion was carried unanimously.

The CHAIRMAN: I thank you very heartily for your kind vote. I can assure you it is a great pleasure to know that our efforts to maintain the high position reached by the Company are appreciated by you, and that we have your support. I am sure it would be difficult to find a body of men working more harmoniously in the interests of the undertaking with which they are associated than your Board of

Directors. Before I sit down, I should like, with your approval, to propose a vote of thanks to the officers and staff. We come here and give you an account of our stewardship for the past six months; but you know that the real work of the Company is being done by its permanent officials, of whom we have such an excellent staff. Let me begin first with the engineering department, which is so ably represented by Mr. W. Doig Gibb. The Board feel that he has answered the high requirements and the high opinion they formed of him when they made their selection. Then, on the other side—the commercial side—which is so admirably represented and cared for by Mr. M'Leod, I will ask him to be so good as to accept this vote, if you pass it, as I am sure you will, on his own behalf, and on behalf of the large, increasing, and important clerical staff.

A Shareholder seconded the motion, which was carried unanimously.

Mr. W. Doig Gibb: Ladies and gentlemen, on behalf of the engineering staff I thank you, Mr. Chairman, for proposing this motion, and you, the audience, for carrying it so heartily. The engineering staff work as one man; and, in a single word, all I can say is that we hope to provide our Chairman with as good ground for an excellent report in the six months to come as we venture to think we have supplied for this meeting to-day. There is just one thing, and it is that in the engineering staff we must also include our Chairman. Mr. Carpenter has been good enough to say that I am all the Board expected me to be. Well, probably for the first time I am inclined to disagree with Mr. Carpenter. The business is so huge that I am yet a learner; and without the valuable assistance and advice of the Chairman I should have cut rather a sorry figure up to the present time. But, with increased knowledge, I sincerely hope to be of increased usefulness to the Company.

Mr. F. M'Leod: That section of the staff for which I am asked to respond will, I am sure, wish me to thank you for your very kind vote. The clerical and commercial staff work as one man with but one desire—namely, to serve your interest to the best of their ability. This desire is certainly not lessened by the fact that we, employees of all ranks, have a stake of some £300,000 in the Company; and, were any stimulus needed, I am sure your kind commendation at this meeting would furnish it. The need for keen intelligence and well-directed effort on the commercial side of our work was never so imperative as it is to-day; I am glad to be able to say that the officers who deal with this side of the business carry out their duties in the most praiseworthy manner, and they richly deserve your approbation. In their name, and on behalf of all my colleagues, I thank you very much for your generous vote.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ended Dec. 31, 1910, which will be presented at the ordinary general meeting on Friday.

The accounts show that, after providing for debenture interest, and including the amount brought forward from last half year, the balance available for distribution is £30,460 12s.; and the Directors recommend payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 13s. 4d. per cent. per annum on the ordinary stock—carrying forward to next half year £11,818 18s. 8d.

As compared with the corresponding half of 1909, the consumption of gas shows a small increase of 0·35 per cent. Coal has cost somewhat less than was anticipated from the higher prices paid, owing partly to a further saving in the quantity used, and partly to a reduction which has been effected in the cost of delivery of a portion of the supply. Against this, however, will have to be set the new tax of 1d. per ton of coal recently levied by the Port of London Authority, which is now in operation.

The prominent feature of the accounts is, however, the comparatively large returns for residuals; coke, tar, and sulphate of ammonia having all fetched higher prices than have ruled for a considerable time. There is also a marked improvement in the production of sulphate of ammonia per ton of coal carbonized.

Continued activity in the sales department has resulted in a substantial increase in the number of consumers; and there has been an exceptional demand for gas fires, cookers, and heating appliances of all kinds. The business done at the various show-rooms, including the supply of lighting appliances, has satisfactorily increased.

The Directors have satisfaction in announcing that they have contracted with the Festival of Empire Exhibition Committee to light with high-pressure incandescent gas the grounds of the Crystal Palace and a part of the Crystal Palace itself, during the forthcoming exhibition; and to supply and maintain the gas-engines required by the Exhibition Committee for generating their own electricity for lighting and other purposes.

Two of the Directors (Sir J. Fortescue Flannery, Bart., M.P., and Mr. John Boraston) and one Auditor (Mr. Thomas Guyatt) retire by rotation; and, being eligible, offer themselves for re-election. Mr. William G. Waller, the Employee-Director who retired by rotation in October last, was re-elected without opposition.

The accounts accompanying the report show that the total expenditure on capital account at the close of the half year (including a nominal amount of £202,500 added by conversion) was £798,144, or £33,219 less than the receipts, inclusive of £49,305 premium capital—£831,363 in all. Only £933 was expended on capital account in the half year. The revenue from the sale of gas was £82,400; the rental of meters and stoves produced £7028; the sale of residuals, £32,311; and the total receipts were £121,871. The following were the principal items of expenditure: Manufacture of gas (including £44,440 for coal and £16,623 for maintenance of works and plant), £67,549; distribution, £18,619; management, £5358; rents, rates and taxes (£5074), and miscellaneous items bringing up the total to £100,233. Among these items is a sum of £1800 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £21,638; and the amount applicable for dividend, as stated in the report, is £30,460.

The statements as to working show that, under the supervision of Mr. S. Y. Shoubridge, the Engineer, 60,820 tons of coal were carbonized in the half year. The quantity of gas made was 732,616,000 cubic feet, of which 684,837,000 cubic feet were sold and 694,376,000 cubic feet accounted for. The residuals were: Coke, 729,840 cwt., of which 143,158 cwt. (estimated) were used in manufacture; breeze, 17,219 yards; tar, 608,387 gallons; ammoniacal liquor, 17,839 butts—the make of sulphate of ammonia being 652 tons.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors state that the sales of gas in the six months ended the 31st of December last exceeded by 3·7 per cent. those in the corresponding period of 1909. The number of consumers increased in the half year by 1067, and that of stoves on hire by 173 cookers and 1193 fires; while 39 and 349 of these appliances were sold to consumers—representing a total increase of 1754. The system of supplying modern high-pressure lamps at an inclusive charge for gas and maintenance has been adopted; and several installations, chiefly for business premises, are now stated to be working with very satisfactory results. As announced in the last report, the price of gas was reduced by 1d. per 1000 cubic feet as from Michaelmas; and the Directors express pleasure in stating that they feel justified in making a further reduction, to take effect after the 25th prox., to 2s. 6d. in the Croydon and Carshalton districts and to 3s. in Caterham.

The accounts accompanying the report show that the total revenue was £125,722, of which £87,818 was derived from sales of gas, £9581 from rental of meters, stoves, and house fittings, and £28,207 from the disposal of residuals. A sum of £58,963 was expended on manufacture, and £18,298 on distribution; rent, rates, and taxes came to £4532; management cost £4414; and the total expenses (inclusive of £700 for the co-partnership scheme) were £91,995. The balance carried to the profit and loss account is £33,727; and the amount available for distribution is £34,360. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,699, and leave a balance of £11,661.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 44,952 tons of coal and 528,079 gallons of oil were used during the half year to manufacture 703,473,000 cubic feet of gas, of which 660,004,900 feet were sold and 668,722,600 feet accounted for. The estimated quantities of residuals produced were: Coke, 26,971 tons; breeze, 5458 tons; tar, 596,921 gallons; ammoniacal liquor, 1,178,327 gallons—the make of sulphate being 434 tons.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

The report of the Directors of the Brentford Gas Company for the six months ended Dec. 31 last, which will be presented at the half-yearly meeting on the 24th inst., contains the satisfactory statement that there was an increase of 7·42 per cent. in the quantity of gas sold, as well as a gratifying advance in the receipts for residual products, compared with the corresponding half of 1909. The combined effect of these increases was to maintain the profit, in spite of the reduction of 2d. per 1000 cubic feet in the price of gas announced in the last report, which was in force during the whole of the December quarter. The consumers increased from 84,954 in December, 1909, to 91,362 in the corresponding month last year; and during the same period there were fixed 7733 additional cooking and heating stoves.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £189,981; from meter and stove rents, to £23,055; and from the sale of residual products, to £40,106—the total receipts amounting to £253,172, compared with £239,576 in the second half of 1909. The expenditure on the manufacture of gas was £137,903; on distribution, £40,042; and on management, £8208—the total expenses being £204,919, compared with £196,885 in the six months ended Dec. 31, 1909. The balance carried to profit and loss account is £48,252, compared with £42,691 this time last year; and the amount available for distribution is £102,693, against £87,806. The Directors recommend dividends at the rates of 5, 12½, and 9½ per cent. per annum, subject to income-tax, on the preference, consolidated, and new stocks respectively.

The working statements show that, under the supervision of Mr. Alexander A. Johnston, the Engineer and Manager, 88,260 tons of coal and 1,526,534 gallons of oil were used in the past half year in the production of 1,573,868,000 cubic feet of gas (including 547,882,000 cubic feet of carburetted water gas), of which 1,431,689,000 cubic feet were sold and 1,453,689,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 55,194 tons; breeze, 9572 tons; tar, 1,274,118 gallons; and ammoniacal liquor, 26,388 butts.

A verdict of "Suicide during temporary insanity" was returned at an inquest in the Liverpool Coroner's Court on the body of John Jackson, a master mariner. Deceased had for some years been afflicted with malarial fever contracted abroad, and had become somewhat depressed. He engaged a bed at a tea-shop, and on the following morning was found dead in bed; the room being full of gas, which was issuing from an unlighted burner.

PROGRESSIVE GAS SUPPLY IN BRISTOL.

Owing to the unavoidable absence, under medical advice, of Alderman J. W. S. Dix, the Chairman of the Bristol Gas Company, the proceedings at the ordinary general meeting last Thursday were presided over by Mr. Fenwick Richards, the Deputy-Chairman. He said he was sure it must be a source of regret to the Chairman not to be there, because the Directors were able to present to the shareholders a very satisfactory account, showing a good balance to carry forward, and with every prospect that they would be able to pay their dividend, not only that year but the next. They had obtained without opposition their Act sanctioning increased capital and giving other little advantages to the Company. Referring to the accounts, shareholders would see that the Company were able to pay a respectable dividend and carry forward a good balance. There had been an increased consumption of gas during the year, which would give them between £2000 and £3000 profit; but they had had very fortunate circumstances with regard to the sale of residuals, which made the additional profit for the year nearly £19,000. He thought it was only fair to explain that this was not all made out of coke and breeze sales during the year, because on Dec. 31, 1909, they held a large stock, and at that time the sale was slow. A change took place, and they were able to get rid of it all at an increased price. He thought this £19,000 profit over the preceding year was almost a record. During the twelve months they had made steady progress; and the history of the Company had been progressive. In 1892, the year before electricity was introduced, their capital expenditure was £831,000. In 1910 it was £1,450,000. And the profit had rather more than corresponded with the additional outlay. In 1892 their profit was £52,000; in 1910 it was £97,000. While their capital had increased 74½ per cent., their profits had increased 85 per cent.; so that while they had been laying out capital freely, it was paying better than it did nineteen years ago. Then it should be remembered that while the price of gas in 1892 was 2s. 10d. per 1000 cubic feet, it was now 2s. The Gas Company were the second largest ratepayers in the city. In the last nineteen years, the rates had risen from £7359 to £14,355. He concluded by moving the adoption of the report and accounts; and the motion was carried unanimously. At an extraordinary meeting subsequently held, resolutions were passed giving the Directors power to issue £400,000 of general capital stock and £100,000 of debenture stock.

PORTSEA ISLAND GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held in the Board-room at the Company's Offices, Portsmouth, on Saturday.

Mr. R. Edgcombe Hellyer presided, and, in moving the adoption of the report and accounts, commented on the favourable position of the Company; and, as evidence of continued development, stated that, compared with the corresponding half year of 1909, the number of consumers had increased by 1587, and the cooking and heating stoves supplied on hire by 682. The sale of gas showed an additional 10 million cubic feet; and against the increased expenditure of £1470, the receipts had increased by £3991, giving £2521 additional profit. He explained that it had been necessary during the half year to expend £1838 out of the extraordinary renewals fund, for the erection of workshops at the Flathouse works, in consequence of the Admiralty having required the surrender of the site upon which the old buildings stood. Referring to the reconstruction of the interior of No. 2 retort-house at the Flathouse works, he stated that the alterations would involve an expenditure of, approximately, £20,000. In reply to a shareholder, who expressed a wish that fuller information should be given in the accounts regarding the trading in fittings, he explained that the item was set out in the statutory form.

The resolution, which was seconded by the Deputy-Chairman, was carried unanimously, as was also the motion for the payment of the usual dividends. The retiring Directors (the Chairman and Mr. R. J. E. Baker, B.A.) and the retiring Auditor (Mr. Ernest Edmonds) were re-elected without opposition; and the usual donation of £50 to the Portsmouth, Portsea, and Gosport Hospital was authorized.

A shareholder proposed that representatives of the Press should be invited to attend the Company's half-yearly meetings; but this was not seconded. The meeting terminated with the usual vote of thanks to the Directors and officers for their services.

NEWPORT (MON.) GAS COMPANY.

The Half-Yearly Meeting of the Newport (Mon.) Gas Company was held on Monday of last week; and in moving the adoption of the report, the Chairman (Dr. H. M. Brewer, J.P.) remarked that, notwithstanding the extreme mildness of the weather up to the end of the year, and the after-effects of the labour trouble, the receipts showed no signs of falling off, except in regard to the public lamps. There had been a remarkable development of high-power lighting for business premises, the full effect of which would be experienced in the early future. They were enabled to pay the maximum dividends on all the stocks of the Company. The Workmen's Thrift Society had passed the tenth year of its existence; and a small surplus had accumulated. The Directors decided to pay a bonus to all the depositors during last year. This would make the interest 6 per cent. for the year; and the Board thought that the step they had taken would be appreciated by the men. Since the formation of the Society, the total amount paid in as deposits was £2991, and the withdrawals £1359; leaving a balance of considerably over £1600.

The report was adopted and the dividends declared; and a cordial vote of thanks was passed to the Directors and the staff. In responding, the Secretary (Mr. T. H. Hazell) stated that gas was as progressive as ever. No shrinkage was shown anywhere. Their own stocks held their own. During the past year, the Corporation took from the Gas Company 220 public lamps, and substituted a less satisfactory light. Despite this, however, the Company had gained 300 high-pressure lamps for business purposes. A message had been received from the workmen thanking the Directors for their kindness. The Engineer and Manager (Alderman Thomas Canning) also responded, and remarked that the Company had a larger number of consumers than ever. The number of lights was increasing continually. The actual number of gas-lights in the town exceeded by thousands that which existed before the introduction of the electric light or incandescent gas, though the consumption of gas did not increase in the same ratio. The present lights gave an enormous advantage to the consumer, who obtained from the burners very much more illuminating power than from those formerly in use.

MALTON GAS COMPANY'S ASSESSMENT APPEAL.

More than the usual interest attached to the proceedings at the half-yearly general meeting of the Malton Gas Company last Wednesday, from the fact that the Company's success the previous day in their appeal against the rating of their property by the Assessment Committee of the Malton Union, as recorded in another column, gave the Chairman (Mr. H. W. Pearson) a good subject upon which to address the shareholders when moving the adoption of the report and accounts. He explained that the previous assessment of the Company's property was settled by agreement in 1894. The gross estimated rental was put down at £1010, and the rateable value of their Malton and Norton property together at £708. Owing to the fact that the Company lost the public lighting of the town (the Urban District Council having introduced the electric light), the Company were of opinion that they were excessively assessed; and, after consulting an expert, they appealed to the Assessment Committee to have the rateable value reduced from £708 to £502. The Committee, after some delay, offered to reduce the rateable value to £550; and the Company accepted the offer. Six weeks later, however, they were astonished to receive a notice from the Committee that they had introduced a new valuation list, and had increased the gross estimated rental of the Company's works from £1010 to £1683, and the rateable value from £550 to £846. This action was really inexplicable; and it was not until the appeal came off that the Directors knew that it was due to the fact that the Committee's expert advised them that the gross estimated rental as settled in 1894 was far too low, and that certain statutable deductions which he was bound to allow would amount to over £800. This would decrease the gross estimated rental of the Company's works to £200, whereas they were only applying for it to be reduced to £502. The result was that the Company had no alternative but to appeal at the Northallerton Sessions; and the result was that the rateable value was reduced to £525, and the gross estimated rental to £1408. The Chairman characterized the action of the Committee, in pretending to agree with the Company and then a few weeks later increasing their assessment, as a "trick;" and, taken in conjunction with other actions, it looked as though the moral tone of local government in Malton was deplorably low. The report was adopted, and a dividend of 6 per cent. for the half year, free of income-tax, was declared.

BOURNEMOUTH GAS AND WATER COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the Bournemouth Gas and Water Company will present at the half-yearly meeting next Friday, they inform the shareholders that the sales of gas and the water-rental in the six months ended Dec. 31 last show a satisfactory increase over the figures for 1909; and residuals also yielded more. It has therefore been decided to reduce the price of gas by a further 1d. per 1000 cubic feet at Lady Day next; making the price 2s. 6d. in Bournemouth and 2s. 10d. in Poole.

The accounts accompanying the report set forth that the revenue from gas was £50,724, and from water £20,207; the sale of residuals produced £11,694; and the total receipts were £91,729. The expenditure (including £1452 for the co-partnership scheme and expenses) was £67,693; leaving £24,036 to go to the profit and loss account. The balance available for distribution is £54,406; and the Directors recommend the payment, after the transfer of £1000 to the reserve, of dividends (less income-tax) for the half year at the rates of 6 and 7 per cent. per annum on the preference and "B" ordinary shares, and at the rate of 15 per cent. per annum on the original shares. This will allow of the addition of £1476 to the sum carried forward, which will stand at £36,786.

The statements relating to the working results show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager of the Company, 23,477 tons of coal, 40 tons of cannel, and 396,559 gallons of enriching oil were used in the production of 423,381,000 cubic feet of gas, of which 384,253,894 cubic feet were sold and 395,638,244 cubic feet were accounted for. The residuals produced were: Coke, 14,057 tons; breeze, 1817 tons; tar, 266,869 gallons; sulphate of ammonia, 203 tons.

Price of Gas at Bodmin.—We regret that the figures in the paragraph on this subject given in the "Journal" last week (p. 396), which came from our local correspondent, were incorrect. The reduction referred to was mentioned in our columns early in the year; and it was then stated that the figure of 3s. 9d., to which the price had been brought down from 4s. 2d. for lighting purposes, was subject to discount for prompt payment varying with the quarterly consumption. The gross price of gas used for cooking, heating, and motive power remained as before, but was subject to discount. The net prices obtainable range from 3s. 7d. and 3s. 1d. down to 3s. 4d. and 2s. 10d. The old net prices were 3s. 8d. and 3s. 7d. for lighting, 3s. 3d. for cooking and heating, and 3s. 3d. and 3s. for motive power. The Bodmin Gas Company and their Manager (Mr. Reginald Greenaway) are to be congratulated on the fact that their prices are now the lowest in Cornwall.

PUBLIC LIGHTING OF HOLBORN.

Gas and Electric Lighting Tenders before the Borough Council.

Once again, after a consideration extending over a period of eight months, the question of the public lighting was brought before the Holborn Borough Council at their meeting last Wednesday. It will probably be remembered that, as recorded in the "JOURNAL" in July last, the Works Committee of the Council unanimously reported in favour of a scheme submitted by the Gaslight and Coke Company for lighting the public lamps by means of low-pressure inverted burners. At that time, a Sub-Committee expressed the opinion, in which the Works Committee concurred, "that the adoption of either electric light or lighting by gas at high pressure would involve considerable expense and disturbance of the pavements, and that by the adoption of improved burners and lanterns on the existing columns a satisfactory improvement in the lighting could be effected at a minimum cost." This conclusion was come to as the result of a series of experiments by eight different firms, during the months of April and May last, in various parts of the borough, when inverted gas-burner lamps were placed so as to afford an opportunity of a fair photometric test being made of the respective illuminants. The result of the tests, which were carried out under the supervision of the Borough Surveyor (Mr. E. F. Spurrell), caused the Committee to come to the conclusion that the best results were obtained from the lamps erected by Messrs. Kempton and Co. and Messrs. Anderson and Co., which gave 27·2 and 26·5 candle power respectively per cubic foot of gas consumed in a two-light lamp. It may be mentioned here that there are 1896 low-pressure lamps in the Council's area, and 28 high-pressure lamps in Kingsway (it is not proposed to alter the latter); and that the borough was the last in the Metropolis to adopt the incandescent burner—the conversion from flat-flame burners commencing during 1903 and being completed only in 1906.

While the experiments already alluded to were in progress, an offer was received from the Gaslight and Coke Company, who were the Contractors for lighting the public lamps of the borough, by which they agreed to undertake the conversion of the whole of the existing burners to the inverted system, under an arrangement whereby the Council would incur no increased expenditure on the lighting and no capital outlay. The price per lamp per annum was to be as follows: For 1-burner lamps, £2 7s. 6d.; for 2-burner lamps, £3 18s.; for 3-burner lamps, £6; for 5-burner lamps, £7 10s. If new lamps were employed instead of the conversion of the existing lamps, the prices would stand as follows: £2 10s., £3 18s., £6, and £7 10s. The Company, if given a contract for ten years, agreed to carry out, at their own cost, the whole of the installation work, including the supply of the necessary lamps, and to charge the above-mentioned rates; the total cost being £6688, as at present paid; while the illuminating power would be increased 75 per cent. The Company's offer included the provision of 200 new circular lanterns, each fitted with five inverted burners, giving 400-candle power each, in Holborn, Tottenham Court Road, New Oxford Street, Charing Cross Road, Shaftesbury Avenue, and Cambridge Circus. They also stipulated that there should be no increase in the price for lighting if the price of gas should be raised during the next ten years; and the lanterns were to become the property of the Council. The Council resolved that the Company's offer should be accepted for ten years—terminating at the end of the first five or seven years upon payment by the Council of £2500 and £1500 respectively.

About this time, a deputation of ratepayers, who had been previously circularized by the Metropolitan Electric Supply Company, appeared before the Council, with Mr. Gamage as spokesman, and expressed themselves in favour of lighting the borough by electricity. They asked that all or some of the Electric Lighting Companies having statutory powers in the area might be allowed to compete. The question was accordingly referred back to the Committee for them to arrange and confer with the Companies and report. The Companies were consequently in the position of knowing their competitors' figures before sending in their own; and, as the Chairman of the Works and General Purposes Committee tersely put it during the debate on Wednesday, when referring to this particular way of tendering, which he characterized as "unfair to any man," one had only to know his opponent's figures, and then cut it "a little," and he was "sure to get the job."

Competitive trials of the two systems of lighting were carried out in Gower Street; the result being the presentation of a

Report to the Borough Council in Favour of Gas.

The Committee stated that on July 27 last they submitted to the Council an offer made by the Gaslight and Coke Company to instal and maintain an improved system of gas lighting in the public thoroughfares of the borough for £6688 per annum (a total of 260,000-candle power being guaranteed), provided that they were given a contract for ten years. The Council did not see their way at that time to accept the offer; but they indicated that they desired more information than the Committee then had before them as to the comparative merits and cost of gas and electricity. Accordingly, in October it was decided to invite the Gas Company and the Electric Lighting Companies having powers of supply in the borough to give a public demonstration of the two kinds of lighting in Gower Street, in order that members might have an opportunity of comparing them in a street where there are no other sources of illumination than the street-lamps. The Metropolitan Electric Supply Company, Limited, conducted the electric light experiment on behalf of all three Electric Lighting Companies. Tests of the lighting were taken photometrically at frequent intervals from Dec. 20 to Jan. 17, with the result that the electric lamps were found to be giving an average of 395-candle power each, and the gas-lamps 318-candle power. This was the result from readings taken at certain specified angles; but, on a further test being made at equal distances along the centre of the road, the illuminating effect was found to be about equal for both kinds of lighting. The specification required that each lamp should give a minimum of 300-candle power.

The Companies were also invited to submit sealed tenders to light the borough according to a schedule of prices per annum for lamps of different illuminating power, ranging from 60 to 2000 candles each. These tenders, which were considered by the Committee on Jan. 26, together with a report of a Sub-Committee thereon, were both for a ten years' contract, subject to the Council having the option to determine at the end of the first five years on payment of a proportion of the capital charges incurred. This sum is estimated at from £2500 to £3000, and would be agreed before the contract is executed. The Committee offered the following observations on the tenders. Each Company undertakes to provide all services, lamps, columns, fittings, painting, and attendance, together with the necessary supply of gas or electric current, for the inclusive prices quoted per lamp. The Gas Company do not quote a total sum for the whole of the lighting; but the Electric Lighting Company estimate that for the total expenditure of £6020 they would provide, according to their schedule of prices, a total of 390,000-candle power. The total cost by either system would, of course, depend upon the number and power of the individual lamps used, seeing that though for the lower powers the Electric Light Company's prices are lower, the reverse is the case as regards powers between 1000 and 1500 candles. The total candle power of the existing lamps is 140,000, and the cost of lighting and maintenance for the year 1909-10, including all extras for foggy days, alterations, &c., was £7102. To effect a satisfactory improvement of the lighting in all the streets, the Committee are of opinion that lamps of 2000-candle power should be provided in High Holborn and New Oxford Street, 600-candle power in Tottenham Court Road, and 400-candle power in the other main thoroughfares; but in all the other streets 90-candle power lamps would be sufficient. This scheme would necessitate a total of about 405,000-candle power; and, calculated on this basis, the annual cost would be as follows: For the electric light, £6602; gas light, £7527. These are outside figures; and it may be that, on further considering details, a reduction of this total candle power and the consequent expenditure may be effected, and that the amount provided in the estimate for the year 1911-12—viz., £7400—may prove sufficient.

The report concluded as follows: The Committee are strongly of opinion that it is not advisable to have two different systems of lighting in the borough; and, having regard to all the circumstances, the difference of cost is not sufficiently great to warrant a radical alteration of the system of lighting on this ground alone. Furthermore, if the Gas Company's tender were accepted, there would be a minimum amount of interference with the pavements, seeing that, except in High Holborn and New Oxford Street, it would not be necessary to lay any new mains; and in those streets it is the intention of the Gas Company to lay a high-pressure main shortly for the purpose of supplying private customers. On the other hand, the Electric Light Company would have to open the pavements to make connection with each lamp, and in some streets to lay mains where at present there are none. In the event of the Committee's recommendation being adopted, they propose, before proceeding to make any alteration of the present arrangement, to lay before the Council a detailed scheme for approval. In conclusion, they recommend: "That the offer of the Gaslight and Coke Company for the improvement and maintenance of the public lighting of the borough, dated Jan. 16, 1911, on a contract for ten years, be accepted, subject to such modification as may be thought necessary; and that the seal of the Council be affixed to the necessary contract to be prepared by the Town Clerk."

Alderman MAX CLARKE (the Chairman of the Committee), in moving the adoption of the report, argued that sufficient reason had not been shown for the Council to abandon gas lighting, when so many of the other boroughs in London had given up electric lighting after a trial, and had gone back to gas. Moreover, in many cases boroughs that actually generated their own electricity had gone in for gas lighting, which seemed to show that there must be something radically wrong about street electric lighting. Personally, he thought the streets of the borough sufficiently well lighted. Anyway, it would be taking a great risk to spend a lot of money on installing a system that might not prove satisfactory, and then having to revert to gas. Referring to the tests made in Gower Street, he said the light was measured at angles of 20° and 50°, and the results gave 395-candle power for the electric lamps and 318-candle power for the gas-lamps. But it was largely a matter of the reflector; for, though the illuminating power in the case of the Electric Light Company was given at the angles named, when the light was measured down the centre of the roadway there was scarcely any difference. The more concave in shape the reflector was, the better was the light at the angles mentioned, but the worse in the street generally; the more convex the reflector, the worse was the light in the neighbourhood of the lamp, but the better it was in the street. The whole question was one of the distribution of the light. No proper comparison could be arrived at until they decided upon the amount of light they were going to have in particular streets. It was proposed to put 40 high-pressure gas-lamps of 1800-candle power in High Holborn and New Oxford Street; while in Tottenham Court Road lamps of 800-candle power would be erected. Clerkenwell Road and Shaftesbury Avenue would have lamps of 400-candle power; certain refuges would have 300-candle lamps; and at important corners, such as at Bedford, Russell, and Montague Squares, 180-candle lamps would be provided for. The remaining streets of the borough would be lighted by 90-candle low-pressure inverted-burner lamps. There would be a total of 405,000-candle power, at £7527 per annum. With regard to the disturbance of the roads, statements had been made in the Press that only a flag stone would have to be moved at the foot of each lamp-column to enable the Electric Light Company to connect up. At all events, the Company would have to open the road at every opposite lamp, as they would only have the public lighting mains on one side of the thoroughfare. This was their experience in Gower Street, where the road was cut across for every alternate lamp. With reference to the Gas Company laying a high-pressure main through Holborn, their intention was to put down the main whether or not they obtained the Holborn contract, to enable them to supply private consumers.

Mr. MOTION moved, as an amendment, that the Committee's report be not adopted, and that the tender of the Electric Light Company be accepted. The adoption of the electric light would, he said, save the ratepayers £925 a year, which in the course of ten years would, at 4 per cent. interest, mean a saving of £11,000 or £12,000. He thought they ought not to sacrifice this money without very good reason. His experience was that at present Holborn was the worst lighted of any of

the Metropolitan Boroughs. There were some thoroughfares, such as Shaftesbury Avenue, which were unsafe for a respectable person to walk through at night by reason of insufficient lighting.

Alderman GLAVE seconded the amendment. He said tenders had been invited, and the Council were in honesty bound to accept the lowest. If the Committee did not want two different systems of lighting in the borough, as they now said, why did they invite tenders from the Electric Lighting Companies? He had been a member of the Council since its formation, and he had never known a case where a tender 15 per cent. lower than another was rejected.

Mr. CHAPMAN, supporting the amendment, said the Council had been told that other boroughs were putting aside electric light for gas. The City of London had not done so, but had installed in Cheapside the finest system of electric lighting in England. If the Council accepted the offer of the Gas Company, they would be pilloried as having bound themselves for ten years to a system that was entirely a thing of the past. He thought they ought to have had on the report the names of the Councils in London who had discarded electric light and adopted gas, or *vice versâ*.

Mr. ANGEL, in support of the Committee, said many boroughs had gone back from electric light to gas. The City of Westminster had done so partly; Bethnal Green had some new gas-lamps; Lambeth had reverted entirely to gas. Then there were Hackney, Southwark, Stoke Newington, and the City of London. It would be a great mistake to embark on an electric light scheme when all the local authorities were going back to gas. Even in Marylebone Road, though the Borough Council had their own electric undertaking, costing upwards of £100,000, the middle of this important road was lighted by gas.

Mr. REID remarked that the matter was referred back to the Committee on the first occasion to ascertain if the electric lighting people could give them a light equal to gas at the same price; and the Company had gone to considerable trouble and expense to demonstrate that they could do so. Moreover, the Council had had a deputation from a number of ratepayers asking for electric light instead of gas, even if it cost more. It was an insult to the Council and to the Electric Light Company, after what had been done, to ask them to pass the recommendation brought forward by the Committee.

Mr. FITZROY DOLL opposed the recommendation, saying that the Metropolitan Electric Supply Company had for many years been trying to get the Council to adopt electric lighting, and had made great sacrifices in order to meet them. They had been put in competition with the Gas Company, and had sent in a lower tender. As honourable men, the Council were bound to accept it.

Mr. MICHELSON moved, as a further amendment, that the whole matter be referred back to the Committee for information as to the boroughs that had given up electricity for gas.

Alderman DIBDIN strongly supported the Committee. He said he did not believe there was any real difference in the results obtained from either gas or electricity. The gas seemed to be dearer, but they did not know what the total difference was. He was informed that if the present posts were used for electric lighting there would be no capital outlay in this direction; but if they wanted taller posts, they would have to pay for them, and the cost of the posts would have to be added to the estimate of the Electric Light Company. This additional expenditure would not be necessary if they kept to gas. This was a point on which he hoped the Council were clear.

Mr. HURST said he would second Mr. Michelson's amendment to refer the matter back for information, especially as to the question of the cost of the electric posts, which ought to have been mentioned in the report.

Mr. MOTION said he was agreeable to accept the amendment just moved, instead of his own, if the Council had some assurance that the subject would be dealt with as soon as possible, as it had already been "hung up" for eight months.

The MAYOR (Mr. H. Porter) suggested an instruction to the Committee to bring up the report again in a month's time.

Alderman MAX CLARKE said he should like to clear up the point about the cost of new posts. The Electric Light Company undertook to convert the existing standards free of charge; but their estimate did not include the provision of new columns, and these were essential to the Council's scheme. If it was decided to raise the columns as high as those in Gower Street, the Council must pay; if the columns were left as at present, which was what the Company suggested, there would be nothing to pay. As far as High Holborn, Holborn, and Oxford Street were concerned, it was proposed by the Electric Light Company to light these streets with arc lamps of about 2000-candle power; and this would cost exactly the same, whether they obtained the light from gas or electricity, for the standards were to be provided by either Company, and were included in the estimate. With regard to municipally-owned electric lighting, to which reference had been made by one of the speakers, they had only to look at the portion of their experimental lighting area that was within the boundaries of the St. Pancras Borough Council, who owned the electricity undertaking, to come to the conclusion that both that part of Gower Street and the side streets were infinitely worse than anything in Holborn. As to the method of tendering, it was unfair to any man whose price was known. One had only to cut it a little, and he was sure to get the job.

A vote was then taken on the amendment to refer the report back, and it was carried *nem. con.*; it being understood that the Committee will bring the matter up again in a month's time.

Explosion at the Newtownards Gas-Works.—Damage estimated at about £100 (which is covered by insurance) was caused early last week by an explosion in the governor-house at the Newtownards Gas-Works. It is thought that some escaping gas must have come into contact, by means of the ventilator, with a lighted gas-lamp attached to the outer wall of the house. The building was wrecked, and some of the apparatus inside damaged; but fortunately no other injury was caused by the explosion. The Manager (Mr. W. H. Roberts) promptly turned off the supply of gas.

Petersfield and Selsey Gas Company.—At an extraordinary general meeting of the proprietors of this Company on Monday last week, held under the presidency of Mr. L. Clayton, Messrs. W. Moore, E. Heron-Allen, F. J. Hazeldine, and H. C. Mitchell were appointed Directors. It may be remembered that at a general meeting of the Company held on the 9th ult. the former Board were considered to be responsible for the present unsatisfactory position of the Company, and a Committee of Investigation was appointed, with power to call in expert assistance, to examine the working and financial basis of the Company.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 430.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 14	5	Alliance & Dublin Ord.	81—84	..	5 19 1
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
200,000	5	Oct. 28	7	Bombay, Ltd.	6½—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 31	15	Bourne-mouth Gas and Water Pref. 6 p.c.	28½—29½	..	5 1 8
311,810	10	,,	7		16½—16¾	..	4 3 7
75,000	10	,,	6		14⅝—15¼	..	3 18 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	257—260	..	4 16 2
330,000	,,	,,	9½	Do. New	200—203	+1	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	220—223	+1	4 18 8
246,320	,,	,,	8	Do. A Ord. Stk.	159—162	..	4 18 9
460,000	20	Sept. 29	10½	British	44—45	..	4 14 5
109,000	Stk.	Feb. 10	6	Bromley, A 5 p.c.	116—118*	..	5 1 8
165,760	,,	,,	4½	Do. B 3½ p.c.	87—89*	..	5 1 2
82,278	,,	,,	5½	Do. C 5 p.c.	106—108*	..	5 1 10
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb.	84—86	..	4 1 5
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	3½—4½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	6—6½	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88—90	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	109½—111½	..	4 9 8
1,513,280	Stk.	,,	5/9/4†	Commercial 4 p.c. Stk.	113—116	..	4 14 3
560,000	,,	,,	5⅓†	Do. 3½ p.c. do.	108—110	..	4 16 11
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77—79	..	3 15 11
800,000	Stk.	,,	4	Continental Union, Ltd.	94—97	+2	4 2 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—137	+1	5 2 2
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103—105	..	4 15 3
486,090	10	Jan. 27	12	European, Ltd.	2⅞—27	+2½	4 8 11
354,060	10	,,	12	Do. £7 10s. paid.	19½—20½	+1½	4 7 10
16,179,445	Stk.	Aug. 12	4¾	Gaslight and Coke Gas- 4 p.c. Ord.	107—108	..	4 6 4
2,600,000	,,	,,	3½	3½ p.c. max.	87—89	..	3 18 8
4,062,235	,,	,,	4	4 p.c. Con. Pref.	103—105	..	3 16 2
4,531,705	,,	Dec. 15	3	3 p.c. Con. Deb.	78—80	..	3 15 0
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	94—96	..	5 4 2
82,590	,,	,,	6½	Do. do. 5 p.c.	114—116	..	5 12 1
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17⅛—17⅜	..	6 4 0
131,000	Stk.	Sept. 15	7½	Ilford A and C	147—150	..	4 18 4
65,780	,,	,,	5½	Do. B	116—118	..	4 19 6
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
4,940,000	Stk.	Nov. 11	9	Imperial Continental	185—187	..	4 16 3
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94*	..	3 14 6
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	122—124	..	4 16 9
561,000	Stk.	,,	10	Liverpool United A	220—222	..	4 10 1
718,100	,,	,,	7	Do. B	164—165	..	4 4 10
306,083	,,	Dec. 30	4	Do. Deb. Stk.	102—104	..	3 16 11
75,000	5	Dec. 15	6	Malta & Mediterranean	4¼—5	..	6 0 0
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 11	3½	Monte Video, Ltd.	12½—13	+½	5 7 8
1,775,892	Stk.	July 28	4½	Newc'tle&G'tesh'd Con.	101½—102½	..	4 5 4
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	89—90	..	3 17 9
55,940	10	Aug. 31	7	North Middlesex 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	139—141	..	5 13 6
60,000	5	Sept. 15	8	Ottoman, Ltd.	6½—7	..	5 14 4
31,800	53	Aug. 31	13	Portsea Island A	133—135	..	5 1 8
60,000	50	,,	13	Do. B	126—128	..	5 1 7
100,000	50	,,	12	Do. C	119—121	..	4 19 2
114,800	50	,,	10	Do. D and E.	103—105	..	4 15 3
398,490	5	Oct. 28	7	Primitiva Ord.	7½—7¾	..	4 10 4
796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5¼—5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 29	9	San Paulo, Ltd.	15½—16	..	5 12 6
115,000	10	,,	6	Do. 6 p.c. Pref.	11¾—12¼	..	4 18 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Aug. 31	10	Sheffield A	232—234	..	4 5 6
209,984	,,	,,	10	Do. B	231—233	..	4 5 10
523,500	,,	,,	10	Do. C	231—233	..	4 5 10
70,000	10	Oct. 14	6	South African	10¾—11	..	5 9 1
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	118½—120½*	..	4 10 8
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	87½—89½	..	3 14 6
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	156—158	+1	5 1 3
605,000	Stk.	Aug. 12	5⅜	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	Nov. 11	5	Southampton Ord.	111—113	..	4 8 6
120,000	Stk.	Feb. 10	7	Tottenham A 5 p.c. and B 3½ p.c.	141—143*	..	4 17 11
483,940	,,	,,	5½		114—116*	..	4 14 10
149,470	,,	Dec. 15	4	Edmonton 4 p.c. Deb.	98—100	..	4 0 0
182,380	10	Dec. 30	8	Tuscan, Ltd.	9—9¼	..	8 8 6
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p.c. max.	114—115	..	4 6 11
255,636	Stk.	Aug. 31	6⅔	Wands-worth B 3½ p.c. and 3 p.c. Deb. Stk.	144—146	+1	4 12 6
85,766	,,	Dec. 30	3		73—75	..	4 0 0

Prices marked * are "Ex. div." † Next dividend will be at this rate.

METROPOLITAN WATER BOARD BILL.

Walton's Opposition to Reservoir Site.

A very largely attended meeting was held at the Walton-on-Thames Public Hall last Thursday to protest against the site proposed by the Metropolitan Water Board for a huge reservoir between Walton Bridge and Sunbury Weir. Mr. T. F. Neighbour, the Chairman of the Urban District Council, took the chair, and explained the details of the scheme and the manner in which it would affect the district. The matter was further made clear to those present by means of a plan of the suggested reservoir and the surrounding district which was thrown on the screen. Mr. Neighbour pointed out that the reservoir would have a frontage to the river of about a mile; and he said the question was whether it was necessary for it to be put close to the river, in such a way that it would practically ruin Walton as a residential district. He thought it would be quite feasible to place the reservoir further from the river, where it would not so interfere with a beautiful reach of the Thames. Mr. A. T. Porter said it would involve the shutting up of the main road to Sunbury. They did not wish to prevent the building of the reservoir, but only that it should not be put in the position proposed. There would be a mile of embankment so high that nothing else would be seen on that side of the river. Mr. R. V. Somers-Smith, the district representative on the Surrey County Council, agreed that if built as now projected, the reservoir would be the ruin of Walton. The Council, he added, had a hard battle to fight, as they were opposing a very powerful body.

At times there was some interruption by working men in the hall, who were apparently under the misapprehension that it was intended to try and prevent the reservoir being built at all in the neighbourhood, and that thereby they would be deprived of some work. After they had been convinced, however, that the only intention was to get the site of the reservoir set back (say) half-a-mile from the river, there was no further opposition, and the following resolution was carried unanimously: "That this meeting gives its hearty support to the Council in their opposition to the Metropolitan Water Board's Bill, so far as the proposed site is concerned." In answer to a question, Mr. Neighbour said the cost of opposing the Bill in Parliament would probably be from £1000 to £1200, or equivalent to a 2½d. rate.

The Directors of the Ipswich Gas Company have in contemplation the supplying of gas to the village of Bramford; and with a view of acquainting the inhabitants with the advantages to be derived from its use, a lighting and cookery demonstration was given, the gas for which was conveyed to the spot in cylinders, under high pressure. It was pointed out that the price of gas at Bramford would be exactly the same as at Ipswich—which was a great concession—and that steps were being taken to ascertain whether the demand for gas was likely to be such as to justify the Company undertaking the extension.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

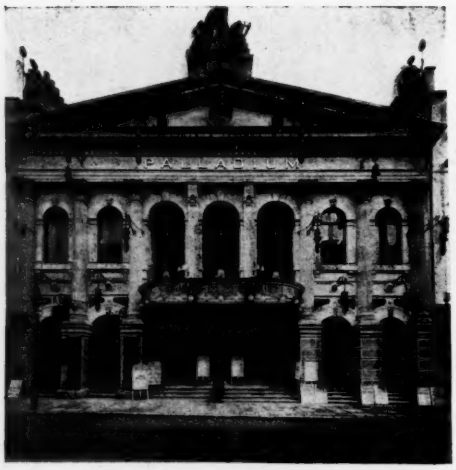
Saturday.

The paper by Mr. J. Murray, a draughtsman in the Glasgow Corporation Gas Department, contributed to the Western District Division of the Scottish Junior Gas Association to-night, was a complete and detailed account of the construction and capabilities of different types of retort-settings. Very appropriately, considering the imminence of the vertical retort, the greater part of the paper consisted of a description of the construction of several types of verticals. This suited the occasion admirably, as by many the differences in design and object were not understood. After reading Mr. Murray's crystallized account of what the various types of plant are designed to do, students of the subject will have a clearer notion of which system would best apply to their case, the circumstances of which may be peculiar. Note must be taken, and with satisfaction, of the fact that the experimental setting of vertical retorts which has been erected by Mr. Alexander Wilson in Glasgow has proved so very satisfactory that his Committee have now approved of the erection of a vertical section capable of producing 5 million cubic feet of gas per day. Mr. Wilson's outlook to the time when the works at Dawsholm will contain only vertical retorts is also worthy of note. The spectacle will be so unique when realized that the wish that the day is not far distant is natural. When it arrives, the Gas Department of Glasgow will be found leading the way in Scotland in the all-important province of carbonization, which is as it should be, when the magnitude of the interest involved is considered. Mr. Wilson has again shown the interest which he takes in the Junior Association by the invitation which he has given to the members to visit the Temple Gas-Works station for the purpose of seeing the vertical retorts at work. Such a visit will be a veritable education.

A circular has been issued by the Glasgow and West of Scotland branch of the Smoke Abatement League, inviting the co-operation of the citizens by installing a smokeless method of heating. The recent fog in the city, it is said, had again emphasized the necessity for action in dealing with the problem. The circular proceeds to state that, as the Council of the League are aware that the absence of smoke from the atmosphere would render fogs comparatively harmless, they invite the citizens to consider the advisability of substituting for coal-fires a smokeless method of heating, such as is provided by gas or electricity. They ask the citizens to communicate either with the Manager of the Gas Department or with the Manager of the Electricity Department, in order that he might show them how the one or the other, as they might choose, might be installed in their premises. Ten thousand copies of the circular are being distributed among the occupiers of warehouses, offices, &c., in the centre of the city.

The Special Committee of the Falkirk Town Council which was appointed to deal with the alleged infringement of the Gas Acts by Bailie Henry Russell, in making unauthorized connections with the gas

Another Huge Contract for the Pioneers!



View of the New Palladium Theatre.

We have recently supplied

100 "St. Andrew" Radiators

each fitted with wall-shield and guard, for heating the new PALLADIUM Theatre, which has recently been erected at a cost of, approximately, £250,000, and is the largest, and one of the most modern, luxurious, and well-appointed places of entertainment in London.

The "ST. ANDREW," in construction and effective heating power, has long been recognized as the leading Gas-Heated Steam Radiator of the World.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

supply to his Crown Brass Works, met on Thursday evening. The Town Council, it will be remembered, at first imposed a modified penalty of £1 upon Bailie Russell; but upon his taking exception to the legality of the penalty they cancelled it, and appointed the Special Committee. At their meeting, the opinion of Counsel upon the subject was read, and, in accordance with the opinion, they agreed to instruct an agent to institute proceedings against Bailie Russell for an alleged infringement of the Gas Acts.

From a discussion which took place at a meeting on Monday of the Western District Committee of the Haddington County Council, it is apparent that an endeavour was being made to introduce a gas supply to Gullane—a rising health resort near North Berwick. Messrs. W. Darling and Co., of Glasgow, applied for leave to lay gas-pipes in the roads within the village. Mr. A. Guild said that in dealing with the application the Board had taken into consideration the position of the gas-works; but he considered that this was wrong, as they had no power to attach any such condition as that the gas-works should be placed upon any particular site. The Board had, at a previous meeting, agreed to grant the application, provided the gas-works were erected on a site which they considered more suitable than the one suggested. He protested against the resolution of the Board as unreasonable and hopelessly illegal. The condition laid down by the Board was refused. The applicants would never think of assenting to it. This looks as if the proposal to introduce a gas supply will go no further, on account of the obstruction of the Local Authority.

In the Dumfries Town Council last week, Judge Thomson, the Convener of the Gas Committee, in moving the adoption of the report of his Committee, said there had been a number of complaints about the quality of the gas. He had been at the gas-works every day, with the exception of Sunday, testing the gas for many hours, and he had never seen it better than now. He wished to show how complaints arose without any cause for them. One man complained that his gas was very bad. He went to see what was the cause. The first thing that he noticed was that it was a very old burner. He put in one of the burners with an economizer which they supplied from the gas-works; and then the man admitted that the gas was of first-class quality. A lady complained to him about the badness of the gas. He adjusted the screw of the burner, and in a single moment the place was flooded with light. These examples showed that the outcry about bad gas was simply owing to the negligence or ignorance of those who used it. Mr. Roddan said there was no doubt that there were many complaints about the gas, and he thought not without some grounds. It was all very well to compare an incandescent burner with a flat-flame burner; but it was the flat-flame burner which gave the poor light. Whether it was the quality of the gas or the purification of it that was to blame, he could not say; but certainly there were complaints. Mr. Copland said he had occasion to call attention to the poor quality of the gas in his hotel; but that morning he found out that it was partly his own fault. The pipes had become encrusted. He had had this rectified, and the light was all right now.

The County Council of Renfrew have lodged a petition against the Busby and District Gas Order, in which, among other reasons for opposition, are stated: (1) That the maximum prices proposed to be inserted in the Order are too high; and (2) that the execution of the works proposed to be authorized by the Order would entail upon the County Council additional expense in respect of the maintenance and management of the highways and the construction of sewers and water-mains—there being no provisions in the Order or in the Gas-Works Clauses Acts adequately indemnifying the objectors for any extra expense to which they may be put in superintending the operations.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 476.]

LIVERPOOL, *Feb.* 11.

Sulphate of Ammonia.

Dealers having evidently made up their minds to take in their February commitments without any delay, and many consumers in this country, who have hitherto been postponing their purchases in the hope of a reaction setting in, having now decided to secure at least a portion of their requirements, the feeling in the market has been very buoyant throughout the week. A further advance in prices has been freely conceded, and the closing quotations for prompt shipment are £13 13s. 9d. to £13 15s. per ton f.o.b. Hull, £13 15s. to £13 16s. 3d. per ton f.o.b. Liverpool, and £13 17s. 6d. to £13 18s. 9d. per ton f.o.b. Leith. At the commencement of the week, £13 10s. per ton, f.o.b. Liverpool, was paid for March-June delivery; later, £13 12s. 6d. per ton, f.o.b. Leith, was scored for April-June; while business is reported to have been done for July-December at £13 2s. 6d. per ton, both for Liverpool and Leith shipment.

Nitrate of Soda.

This article is again dearer, and the values on spot now are 9s. 10¼d. for ordinary and 10s. 1½d. for refined quality, less 2½ per cent.

LONDON, *Feb.* 13.

Tar Products.

The markets for tar products have kept very steady during the past week. Pitch is in about the same position, though the volume of new business is not very large. Benzols remain firm. Solvent naphthas also seem a little steadier. There has been a little more inquiry for heavy naphtha, and business has been done at a slightly better price. The improvement in crude carbolic has been maintained; and in the majority of cases the distillers are asking higher prices. Creosote is steady, although there is not very much business doing.

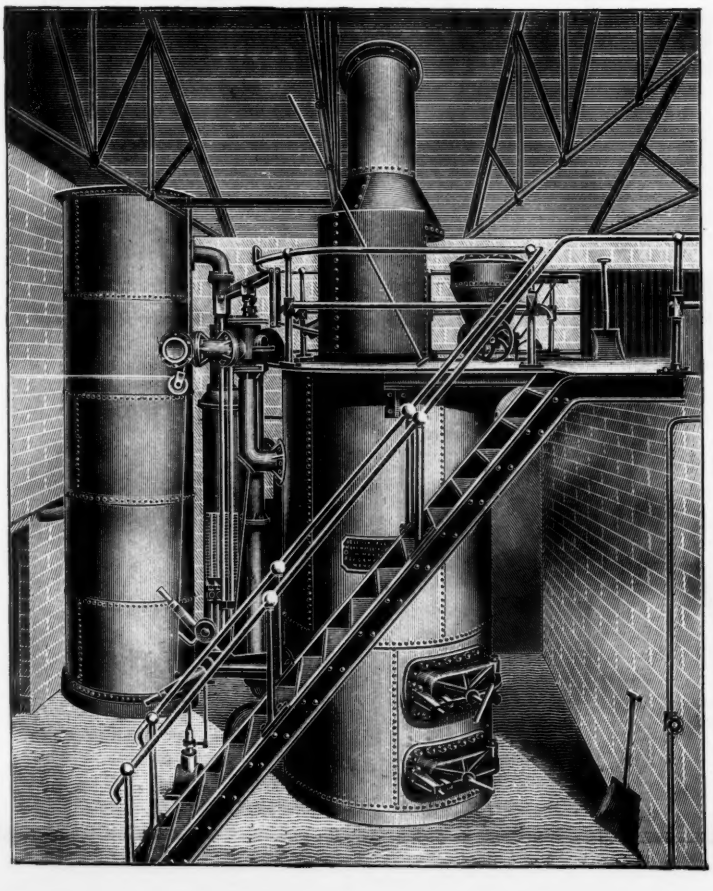
The average values during the week were: Tar, 18s. 3d. to 22s. 3d., *ex* works. Pitch, London, 37s. to 37s. 6d.; east coast, 37s. to 37s. 6d.; west coast, Manchester, 36s. 6d to 37s., Liverpool, 37s. 6d. to 38s., Clyde, 37s. 6d. to 38s. 6d. Benzol, 90 per cent., casks included, London and North, 9¼d. to 9½d.; 50-90 per cent., casks included, London and

DELLWIK WATER GAS PLANT

WITH

TAR CARBURETTING

IN SUCCESSFUL OPERATION AT PRESCOT AND SNODLAND Gas-Works.



Results Guaranteed.

Full Particulars from

R. & J. DEMPSTER LIMITED, MANCHESTER.

London Office:

165, Gresham House, Old Broad St., E.C.

North, 9d. to 9¼d. Toluol, casks included, London, 9⅜d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4⅛d.; North, 3¾d. to 3⅞d.; solvent naphtha, casks included, London, 11⅛d. to 1s.; North, 10⅞d. to 11d.; heavy naphtha, casks included, London, 11⅜d. to 1s. 0⅛d.; North, 10⅜d. to 11d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 1⅞d. to 2d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 7d.; west coast, 1s. 6½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is very firm, and there has been a slight advance of 1s. 3d. to 2s. 6d. at nearly all ports during the last few days. Actual Beckton to-day is quoted £13 5s.; and outside London makes, £13 to £13 1s. 3d. In Hull, £13 12s. 6d. to £13 15s. is asked; in Liverpool, £13 15s.; in Leith, £13 15s.; and in Middlesbrough, £13 12s. 6d. to £13 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a strong general demand for coals, but with less pressure than was shown a few weeks ago. In the steam coal trade, best Northumbrians are from 10s. to 10s. 6d. per ton f.o.b., second-class steams are from 8s. 9d. to 9s. 6d., and steam smalls from 4s. 6d. to 6s. 6d. The output is large, and is very well taken up for this time of the year, when this branch of the trade is usually dull. In the gas coal trade, there is a slightly reduced demand. But it is still heavy; and good gas coals are firm in the market. For Durham gas coal, the prices range from 8s. 9d. to 9s. 6d. per ton f.o.b. for the usual kinds, according to quality; while "Wear specials" are in request at 10s. 6d. As to the contracts reported, there are one or two for Scandinavian ports for moderate quantities at near the current prices; and some sales are believed to have been made at from 9s. 9d. per ton f.o.b. for the season's shipment. Coke is steady. Gas coke is in fair demand at from 14s. to 14s. 3d. per ton f.o.b.

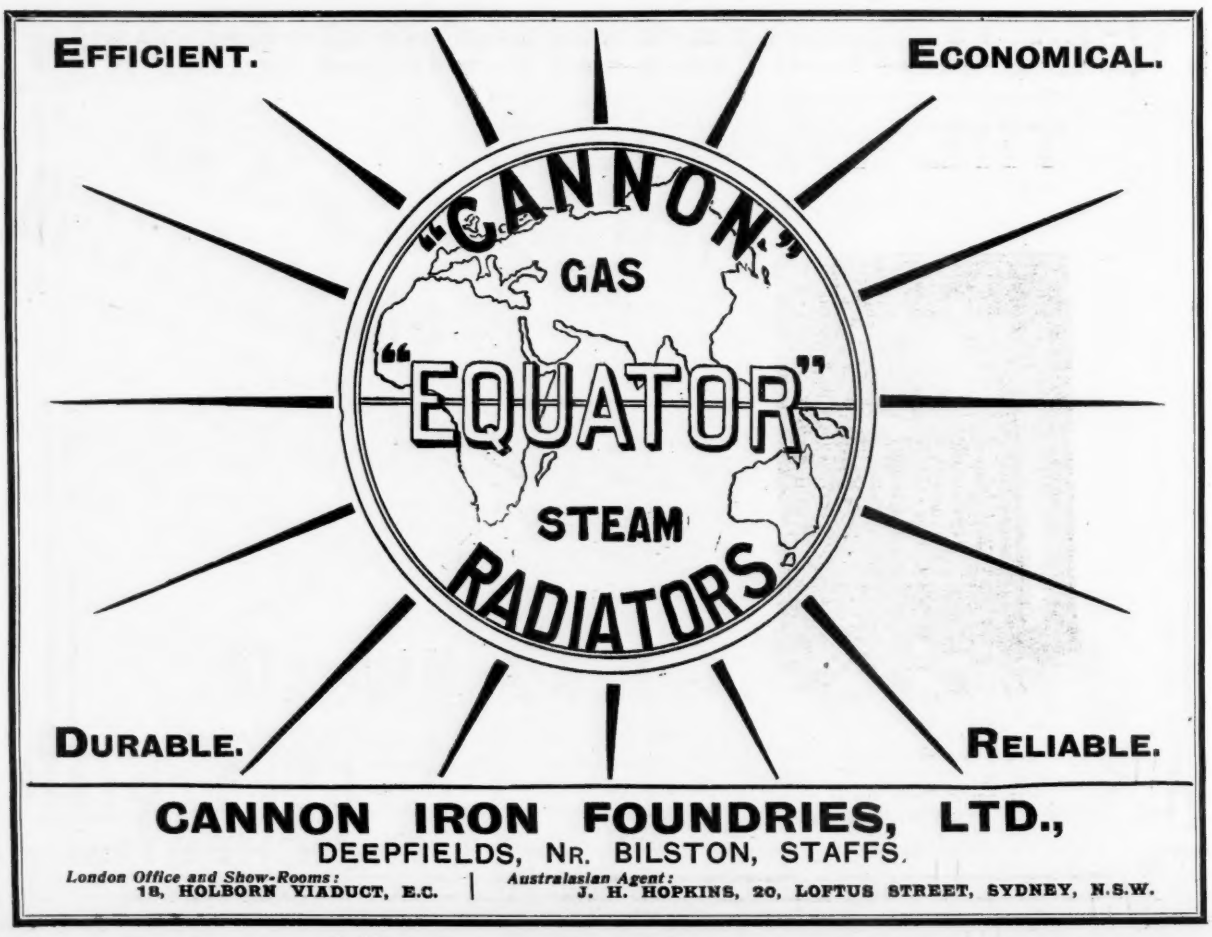
Scotch Coal Trade.

The market was fairly active last week. Foreign buyers have been making inquiries regarding supplies for the season, and considerable business, it is reported, has been done. Prices are said to be about 1s. less than at this date last year. Small stuffs are plentiful. The prices now quoted are: Ell, 9s. 6d. to 10s. per ton f.o.b. Glasgow; splint, 9s. 9d. to 10s.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 257,285 tons—a decrease of 31,333 tons upon the preceding week, and of 46,599 tons upon the corresponding week of 1910. For the year to date, total shipments have been 1,307,222 tons—a decrease of 19,052 tons upon the corresponding period.

The Lighting of Woodbridge.

Correspondence has taken place between the Lighting Committee of the Woodbridge Urban District Council and the Woodbridge Gas Company, with a view to the conversion of all the remaining flat-flame burners in the street-lamps throughout the town into incandescent burners, owing to the fact that, in consequence of the general adoption of the latter burners by private consumers, the Company now manufacture gas of lower illuminating power than formerly, and consequently this gives less light from ordinary burners. The Gas Company had informed the Committee that the cost of fitting the remaining street-lamps with incandescent burners would be £100; and they said that, if the Council would contribute half the amount, the Company would carry out the alterations. This the Committee declined to do; offering to recommend the Council to enter into a contract for seven years if the Company would provide the incandescent burners. The reply by the Gas Company pointed out that the offer they had previously made was very liberal, fair, and reasonable. If accepted, it would leave the Company to bear the entire increased cost of future maintenance; and all that was asked of the Council was that they should meet the Company in the rather heavy initial outlay in installing the new lights. The Directors fully realized that the improved light would be a great advantage to the public, but financially of no value whatever to the shareholders; and so they felt that the Council should share the cost of the improvement. The Lighting Committee are to consider the matter and report at the next meeting of the Council.

East Dereham Gas Manager's Salary.—Referring to a recommendation of the Gas Committee that the salary of the Gas Manager (Mr. H. Kitson) should be increased to £160 per annum, Mr. Brett told the members of the East Dereham Urban District Council that Mr. Kitson had been in the service of the Council for twelve years, starting at a salary of £125. After four years, his work was found so satisfactory that on application his salary was increased by £10. From then until the present time, he had not asked for an increase; but his (Mr. Brett's) opinion was that had Mr. Kitson asked for an increase, the Council were so satisfied with his work that they would have granted it. When Mr. Kitson first came to Dereham, the gross profits on the gas-works were £400 a year; the gross profits now were £1200—a very remarkable increase. This was partly due, no doubt, to natural growth, and partly to the splendid management of the whole concern and Mr. Kitson's skill. He did not look upon Mr. Kitson as a gas manager, but more as a gas engineer. He was an excellent servant; and it was a testimony to his skill and ability that the recommendation was a unanimous one. The Chairman (Mr. J. R. Goshawk) said that last year Mr. Kitson made 10,660 cubic feet per ton of coal, against the 9920 cubic feet which was being made when he came. He had also saved the Council considerable sums in connection with the erection of the retort-benches. The recommendation was agreed to.



Sanitary Progress and Decrease of Fog.—Speaking at the recent annual dinner of the Sanitary Inspectors' Association, of which he is President, Sir James Crichton-Browne said within recent years there had been a marked decrease in the frequency and intensity of London fogs. Twenty years ago, as many as fifty foggy days were noted in ninety days of winter three months. Since then there had been a steady diminution; so that during the winter of 1909-10 the number of foggy days was eleven. No doubt the increased use of gas and electricity for heating and cooking had done something to diminish fog; but Sir James claimed that the main factor in the purification of our winter atmosphere had been practical sanitation.

Electric Lighting at Hastings.—The abstract of accounts for the borough of Hastings for the year ended March 31 last has just been issued by the Borough Accountant (Mr. G. R. Butterworth). It shows that, on the date named, of loans amounting to £170,765, £52,708 had been paid, and that a further sum of £14,143 was available for repayment of debt as opportunity offered. The revenue account for the year showed an income of £17,627 (an increase of £779 on the previous year); the expenditure being £9704. The gross profit made by the undertaking was £7923. It is pointed out that the gross profit was insufficient to meet interest and sinking fund charges by the sum of £2919, compared with £3801 in the preceding year.

Electric Lighting Loss at Sleaford.—In 1901, Sleaford first enjoyed the luxury of electric lighting; and the carrying on of the undertaking by the Urban District Council between that date and March, 1910, has resulted in a deficit on the actual working of £1705. Of the total sum borrowed, £2515 has been repaid out of revenue. It seems that the loss on the net revenue account for the year ended March 31, 1909, was £290, and that for the following twelve months, £255. A writer in a local paper refers to the undertaking as an "asset which increases year by year in financial value." Seeing, however, that it is involving its owners in a fairly steady annual subsidy, the word "liability" might be thought a more accurate description than "asset" to apply to the concern, when setting out to arrive at its "financial value."

A Fatal Gas-Main Fracture.—An inquest has been held by the Manchester City Coroner on the body of Sarah Ann Southworth, of Ancoats, who was found dead under somewhat peculiar circumstances. Her husband, on arriving home one evening, discovered her sitting in a chair as if unconscious; but a doctor who was summoned declared that Mrs. Southworth had been dead for some hours. There was a strong smell of gas in the house; and subsequent excavations resulted in the discovery of a broken 6-inch gas-pipe in the street in front of the premises. It was stated that it was quite possible for gas to have escaped from the pipe through the ground into the house, and thus have caused the fumes from which the woman apparently died. Mrs. Southworth had for some time been medically attended for heart trouble and rheumatism. Two doctors attributed the fatality to coal-gas poisoning, and the Jury found that death was due to gas poisoning accidentally caused.

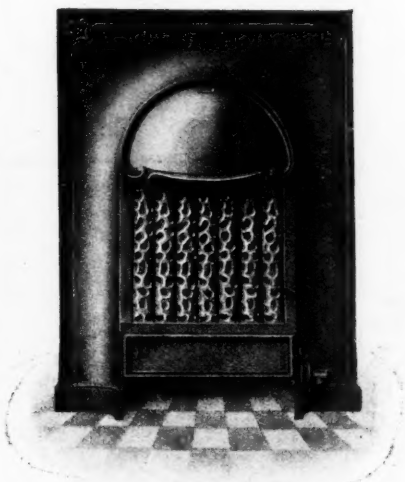
Salary of the Devonport Water Engineer.—It was decided at a meeting of the Devonport Town Council last Thursday to raise the salary of Mr. F. W. Lillicrap, the Water Engineer, by £30, and by further annual increments of £25 to £450. Alderman Blackall, the Chairman of the Water Committee, said that, when Mr. Lillicrap was appointed, it was arranged that if they carried out large works a special engineer should be engaged. Mr. Lillicrap had, however, carried out large improvements, and the construction of the new reservoir was being done from his plans and under his superintendence. The Corporation had thus saved about £4000.

Chester Water Company's Bill.—At the half-yearly meeting of this Company last Thursday, the Chairman (Mr. F. E. Roberts) said the Company's Bill, which had been sanctioned by the shareholders, was now practically before Parliament; and the Directors hoped it would go through in due course. They were not applying for any additional powers, and they did not ask for any higher rates. By the saving on their pumping-expenses, as well as in their filtration arrangements, they would be able to pay their dividends without trespassing on the public or seeking further powers of any kind. The report was adopted, and the usual statutory dividends were declared.

Lighting of Brimington.—A Sub-Committee having reported to the Brimington Parish Council in favour of lighting the streets with gas, an animated discussion took place on the rival merits of gas and electricity. It was stated that the Whittington Gas Company offered to supply lamps right out for £3 3s. each; and the charge for gas would be 2s. 11d. per 1000 cubic feet. The Staveley Coal and Iron Company were prepared to supply electric light at a cost of £2 17s. 6d. per lamp—42 of these of 50-candle power, and 18 of 100-candle power—all to be kept lit throughout the night for the six winter months. A resolution in favour of gas was carried unanimously.

Weston-super-Mare Gas Bill to be Unopposed.—A short time ago, the Weston-super-Mare Urban District Council provisionally decided to oppose the Bill promoted by the Gas Company to obtain additional powers, including the raising of £80,000 of additional capital, pending a meeting between the Directors and a Committee of the Council. This took place on Monday last week. A letter was read from the Council's Parliamentary Agents objecting to the amount of capital proposed to be raised, and expressing the opinion that £50,000 would be ample. The Directors of the Company were then admitted, and their Chairman (Mr. Hans F. Price), after some discussion, undertook, if it would meet the requirements of the Council, to amend the Bill by reducing the amount of the proposed capital to £55,000, withdraw clause 21 (giving the Company power to enter premises and remove fittings), and pay the costs incurred by the Council. The Committee thereupon accepted the compromise; and instructed the Clerk to authorize the Parliamentary Agents, subject to the Bill being amended, and a satisfactory undertaking being obtained from the Company's Agents, to agree to it. This decision was subsequently confirmed at an open Council meeting.

THE LOWER THE HIRE



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Best Berlin Black, **21s.**
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Rates of Gas Fires the greater the demand for them. Our Prices for the

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series of Gas Fires are lower than those of other makers for similar fires, and are such as enable them to be let out on hire at low but remunerative rates.

The low selling Prices also tempt Consumers to buy them outright, or on hire purchase terms.

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WORKS:
Gothic Works, EDMONTON, N.; and Gothic Ironworks, FALKIRK.
SHOW-ROOMS: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; and 333, Queen Street, MELBOURNE.

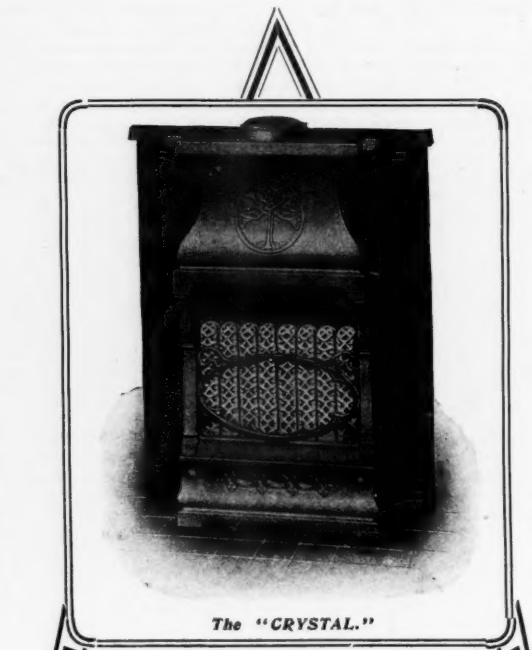
Notable Prosperity of the Colne Valley Water Company.

Presiding at the Half-Yearly Meeting of this Company on Tuesday last, the Chairman (Mr. C. E. Keyser) had an excellent report to place before the proprietors. First of all, however, he referred to two or three personal matters. There was the deeply regretted death of one of the Directors, Mr. David Pitcairn; and then mention was made of the election to the vacancy of Mr. A. Keith Carlyon. Following, there was allusion to the loss, in the capacity of Secretary, of the services of Mr. W. Verini, who had been connected with the Company from its foundation, and was son of the first Secretary. Increasing deafness had caused Mr. Verini to relinquish the responsible position; but the Directors, the Chairman explained, had retained his services as Hon. Consulting Director. Through the good offices of Mr. W. B. Bryan, the Directors had secured for the position of Secretary and General Manager Mr. C. P. Sinclair, who had had great experience in water undertakings and who, in the short time he had been with the Company (he might say, and his colleagues would bear him out), had obtained a wonderful grasp of the affairs of the Company, and of the district. Turning to the accounts for the half year, they showed that the total amount received for water-rates amounted to £24,185, compared with £22,665 in the second half of 1909—an increase of £1520. The increase in the first six months of the year was £1644; so that the total for the year was £3164. They could not compare the increase with that of 1909 over 1908, seeing that they were now charging on the lower scale. The number of new supplies added during the six months was 562, representing an estimated annual water-rental of £1368; making the total new supplies for the year 1194, and the estimated annual water-rental £2854. The figures for 1909 were respectively 1085 and £2538; so that the year showed a further considerable advance. The number of new supplies last year constituted a record in the history of the Company; and with the increased railway facilities and developments of town suburbs, it was expected the numbers in future years would advance in greater ratio than in the past. The total number of supplies amounted to nearly 19,500; and the population supplied to about 107,000. When the Company was started, it was believed that £100,000 would be sufficient capital in order to enable the concern to supply the whole district. The total capital expenditure to date was upwards of £440,000. The total amount of rates and taxes, exclusive of income-tax, for the year amounted to £4461, which represented nearly 11 per cent. of the total water-rental per annum. The profit for the half year amounted to £15,903; and after paying interest on the debenture and preference stock, and transferring £500 to the contingency fund account, the balance of the dividend and interest account was £17,967. Out of this, the Directors recommended the payment of the full statutory dividends at the rates of 10 and 7 per cent. per annum on the several classes of ordinary stock; and, in addition, a payment of 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks, leaving nearly £5000 to carry forward. The quantity of water pumped, as compared with the second half of 1909, showed a decrease of 8½ million gallons. This was, of course, due to the wet season. Taking the whole year, only 500,000 gallons more had to be pumped than in 1909. Owing to the great precautions taken against waste, the consumption per head per day for domestic purposes was only 20·7 gallons—being a decrease of 1·73 gallons. With regard to the works, a new engine suction tank had been completed; and an extension had been resolved upon of the 14-inch western trunk main, with the view of meeting the growing needs of Harrow and Wembley. The Directors recently issued £12,000 of "D" 7 per cent. stock, yielding £19,852—an average of 165½ per cent. The motion for the adoption of the report and accounts was seconded by Mr. A. Helsham-Jones (Vice-Chairman); and some congratulatory remarks were made by Mr. W. B. Bryan. He pointed out that in the half year the rates and taxes (exclusive of income-tax) amounted to 30 per cent. of the whole of the expenses; so that the Company were contributing a considerable sum to the local revenues. In addition to this, through the suppression of waste, the local authorities had less waste of water to deal with at their sewage farms and so forth. After this, the dividends referred to in the Chairman's speech were declared.

Reduction in Price at Tunbridge Wells.—The Tunbridge Wells Gas Company announce a further reduction of 1d. per 1000 cubic feet in the price of gas to all consumers within the borough from the commencement of this quarter; bringing down the charge to 2s. 6d.

Wandsworth and Putney Gas Company.—The accounts of this Company for the six months ended Dec. 31 last, which will be submitted to the shareholders at the half-yearly general meeting next Tuesday, show a profit of £15,393 on the revenue account, and a sum of £24,126 available for distribution. The Directors recommend the declaration of dividends at the statutory rates of £8 5s., £6 15s., and £5 15s. 6d. per cent. per annum respectively on the "A" and "B" consolidated stock and the "C" ordinary stock. They will also recommend that the salary of the Secretary (Mr. Charles W. Braine) shall be increased. As mentioned elsewhere, the Directors have made a further reduction of 1d. per 1000 cubic feet in the price of gas as from Christmas last; bringing it down to 1s. 9d.

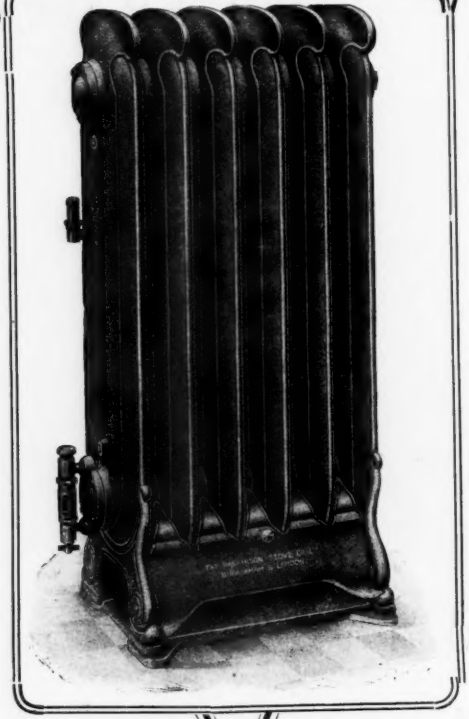
Tavistock Water Supply.—In view of the fact that the Duke of Bedford is about to sell his estate at Tavistock, the District Council have decided to purchase a number of the properties of a public character; and last week their decision was endorsed by a meeting of the ratepayers. Among the properties are the water-works, which the Chairman of the Council (Mr. R. D. Doble) included with the markets as things which are essential to the town, and should be under the control of the ratepayers. It was stated that the net assessable value of the water-works was £168. Mr. Doble said that the effect of the purchase would be a temporary rise in the rates; but by a readjustment of the charges they could make the water supply a paying concern. It is proposed that the price to be paid shall be fixed by arbitration, and that, in order to save expense, there shall be only one arbitrator; but the Council will engage the services of a water engineer to advise them. One of the points to be decided is the area of the gathering-ground which it will be necessary to acquire. In a preliminary consultation with the Local Government Board, a suggestion on this point has been made; and the Engineer is to advise the Council on this subject.



The "CRYSTAL."

FIRES
AND
RADIATORS
UNSURPASSED FOR EFFICIENCY
AND
ECONOMY IN GAS CONSUMPTION
Bear the Name
PARKINSON.

The PARKINSON STOVE CO., Ltd.
(Incorporating Maughan's Patent Geyser Co.),
BIRMINGHAM & LONDON.



Petersfield Water Supply.—The Local Government Board have sanctioned the loan of £6042 by the Urban District Council at Petersfield for the purchase of land and wayleaves, with an additional £6008 for works of water supply. The intention is to obtain the supply by gravitation from Oakshott, near Haslemere.

Cowes Water Supply.—It has been reported to the East Cowes District Council by their Water-Works Manager that the plans and estimates have been completed for the construction of a reservoir to hold a million gallons on the Osborne and Royal Naval College estate. The cost is estimated at £3500; and the Local Government Board are to be asked to approve the plans and sanction the loan.

Water Supply for Chiddingfold.—Consequent on the inadequate supply of water to the parish of Chiddingfold (Sussex), a Company has come forward to furnish the requisite needs of the inhabitants by erecting a suitable reservoir. The water will be brought from Dunsfold, and Dr. Rideal has certified that it is soft, clear, inodorous, and suitable for potable purposes. The Company will probably supply some other portions of the district.

Sulphate Plant Extensions at Stafford.—As the result of a report submitted by the Engineer (Mr. W. M. Valon), the Gas and Electricity Committee of the Stafford Corporation have decided that extensions and additions shall be made to the sulphate of ammonia plant, so as adequately to increase its capacity to deal with the ammoniacal liquor, and have accepted Messrs. C. & W. Walker's tender (amounting to about £300 net) for carrying out the work.

Aberavon Gas Supply.—On behalf of the Local Government Board, Mr. Maxwell has held an inquiry at Aberavon into an application by the Corporation for further borrowing powers for gas-works purposes. Mr. Vesey Knox, who appeared on behalf of the Margam Urban District Council, said that, as more than half the number of the customers of the Aberavon Corporation gas undertaking lived in the Margam district, it seemed unfair that they—the Margam ratepayers—should have to pay to the Aberavon Corporation large sums annually, with which they could do as they liked. What the Margam Council wanted was to purchase the existing mains in the Margam district, and supply gas for themselves. If their Parliamentary Bill was passed, Aberavon would not need to increase their borrowing powers.

Launceston Gas Company's Provisional Order.—The Launceston Rural District Council had under consideration at their last meeting the fact that the Launceston Gas Company are applying for a Provisional Order, under which they will have power to supply gas outside the borough. Mr. J. Couch pointed out that the Devon County Council had decided that no opposition should be offered to the Company, if provision is made in the Order for the maintenance of the roads for a certain period after they have been broken up. He thought the District Council should require a similar provision, and that the period should be two years. It was decided that the Clerk should confer with the Gas Company with a view to getting provision for the maintenance of the roads included in the Order; and in the event of the Company agreeing to the proposal, no opposition should be offered.

Bromley and Crays Gas Company.—At the half-yearly general meeting of this Company last Thursday (Mr. Alexander Dickson presiding) the Directors reported that, notwithstanding the prevalence of mild air temperature throughout the past half year, the sales of gas had increased by more than 2 million cubic feet. The additional manufacturing plant at the Bromley works, in substitution for those abandoned at St. Mary Cray, had fully justified its provision; and only one-sixth part of its cost now remained to be written off the future revenue. The Directors recommended dividends at the rates, under the sliding-scale, of 6, 4½, and 5½ per cent. per annum on the several classes of stock, all subject to income-tax. The payment of these would absorb £9261 out of the £12,108 available; leaving £2847 to be carried forward. The Chairman, in moving the adoption of the report and accounts, said he was pleased to be able to congratulate all who were interested in the Company, and those who were served by it, upon its established and increasing prosperity. It was in every way advantageous to a district that a body entrusted with the supply of a commodity so essential for its industries and home uses as gas should be corporately strong enough to give the best possible supply, with the latest advantage of every form of improvement, as he confidently claimed that the Company now did. The report was unanimously adopted. Before the proceedings closed, the Chairman paid a tribute to the loyal and successful efforts of the chief officers, the staff, and the employees; and, on behalf of the Board and the shareholders, tendered thanks to Mr. William Woodward, the Chief Engineer, and to Mr. H. W. Amos, the Secretary of the Company.

The Vertical Gas-Retort Syndicate, Limited, are issuing a small illustrated pamphlet giving "a few facts about the intermittent Dessau system of vertical retorts," which they control in this country.

The rural portion of Llandudno Junction is to be lighted with gas supplied to the District Council by the Conway Corporation. Since the provision of street-lamps, oil has been used for the illuminant.

The Parkinson Stove Company, Limited, have appointed as their General Manager, Mr. P. C. Mawbey, who has for a number of years past acted as District Manager and Representative of the Richmond Gas Stove and Meter Company.

The annual report of the Walsall Corporation gas undertaking for 1910, shows a net profit of £7010. The amount expended during the year on capital account was £4951. The sales through slot-meter reached £8886 6s. 6d., making a total of 2,027,918 pennies.

As an indication of the growing popularity of gas-heating stoves, it may be mentioned that in a comparatively small town in the Midlands where steps were recently taken to popularize the use of these appliances, between 300 and 400 fires were supplied and fitted within a period of ten weeks. The fires adopted were those of Messrs. John Wright and Co., with their patent "Thermo X" firefront; the stoves being offered on simple hire terms and fixed free.

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LOOM WOVEN

GAS MANTLE

THE STRONGEST MANTLE ON THE MARKET.

Absolutely the **Best and Cheapest** for Street Lighting and Maintenance Work.

Samples Free for Testing Purposes.

Entirely British Made.

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3, Gracechurch St., LONDON, E.C.

The Union Incandescent Fittings Company, Limited, with a capital of £1000, in £1 shares, has been formed to take over the business of a manufacturer of incandescent gas-mantles, fittings, and accessories carried on at 103, Union Street, Oldham, as the Union Incandescent Fittings Company.

It has been decided by the Officials' Conditions of Service Committee of the Manchester City Council to defer further consideration of the matter of salaries till the Finance Committee have reported, and "the Council have come to a decision regarding the retiring age of officials and the question of superannuation allowances."

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Feb. 11. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar crude	per ton	22/6	19/6 22/6	19/6 23/–	19/6 22/6	19/6 22/6	—
Pitch	,,	38/–	37/– 37/6	37/6	38/6 39/–	37/6	37/–
Benzol, 90 %	per gallon	–/11¼	–/9½	–/9	–/8 –/8½	–/9	–/10½
Benzol, 50-90%	,,	—	–/10	–/9½	–/8¼ –/8½	–/9	—
Toluol, 90%	,,	–/10¾	–/9½	–/10	–/10	–/9⅝	–/9¾
Crude naphtha, 30%	,,	—	–/3⅝	–/3½	–/4	–/4	—
Light oil, 50%	,,	—	–/3½	–/3⅜ –/4	–/3½	–/3½	—
Solvent naphtha, 90-160	,,	—	–/10½ –/11	–/10	–/10½	–/11	–/11
Heavy naphtha, 90-190	,,	—	–/11	–/11½	–/11½ –/11⅝	–/11¾	–/11
Creosote in bulk	,,	–/2½ –/2¾	–/2 –/2¼	–/2	–/2⅛	–/2⅛	–/1⅞
Heavy oils	,,	–/3¾	–/2½ –/3	–/2¼	–/3	–/3	–/3
Carbolic Acid, 60's	,,	1/8	1/6 1/7	1/7	1/6¾	1/6¾ 1/7	1/6
Naphthalene, crude drained salts	per ton	—	42/6 45/–	40/– 42/6	47/6 50/–	47/6 50/–	—
,, pressed	,,	—	60/–	63/–	60/– 65/–	67/6	—
,, whizzed	,,	—	—	—	70/– 72/6	70/–	65/–
Anthracene	per unit	–/2	–/1⅜	–/1½	–/1¼	–/1¼	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER AND SECRETARY. Llanelly Gaslight Company. Applications by March 3.
ENGINEER (FRENCH) FOR TAR DISTILLATION. No. 5352.
HEAD CLERK AND CASHIER. Maidstone Gas Company. Applications by Feb. 16.
REPRESENTATIVE. No. 5349.
WORKING FOREMAN. Abertillery Gas Works.
CANVASSERS. No. 5357.

Situations, &c., Wanted.

AGENT OR SECRETARY. No. 5356.
SULPHATE PLANT REPAIRER, &c. Davis. Shepherd's Bush.

Plant, &c. (Second-Hand), For Sale.

HYDRAULIC MAIN AND TAR VALVES. Ilkeston Gas-Works.
STATION METER. Oldbury Gas Department.

Patent Licence, &c.

INCANDESCENT VAPOUR LAMPS. L. DUVINAGE, Brussels.

Meetings.

BARNET GAS AND WATER COMPANY. Holborn Restaurant. Feb. 28. One o'clock.
BRENTFORD GAS COMPANY. St. Ermin's Hotel. Feb. 24. 2.30 o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Offices. Feb. 28. Three o'clock.
NORTH MIDDLESEX GAS COMPANY. London Office. Feb. 27. 2.30 o'clock.

Stocks and Shares.

SOUTH WEST SUBURBAN WATER COMPANY. By Auction. Feb. 28.
SOUTHAMPTON GASLIGHT AND COKE COMPANY. By Tender. Feb. 28.
SOUTHEND WATER COMPANY. By Auction. Feb. 28.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. By Auction. Feb. 22.

TENDERS FOR

Cookers.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 21.

Fire Clay Goods.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 21.

Gasholder.

BRITON FERRY URBAN DISTRICT COUNCIL. Tenders by Feb. 22.

Gasholder and Tank.

BROADSTAIRS GAS COMPANY. Tenders by Feb. 21.

General Stores (Oil, Lime, Ironmongery, Sulphuric Acid, Brass Cocks, Tools, &c.).

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 21.
OSSETT CORPORATION. Tenders by Feb. 21.

Meters.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 21.

Pipes, &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 21.

Tar and Liquor.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 21.
EXETER GASLIGHT COMPANY. Tenders by March 3.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by Feb. 28.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
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Telegrams: "SATURATORS, BOLTON." Telephone 0848.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
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REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
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ANY QUANTITY. ANY PORT. ANY STATION.
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110, CANNON STREET, LONDON.

IT is worth Your While to Buy Direct from the RELIANCE LUBRICATING OIL COMPANY GUARANTEED ANTI-CORROSIVE LUBRICANTS—viz., Motor Waggon Oil, 1s.; Motor Car Oil, 1s. 6d.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 1s. 9d.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt.
THE RELIANCE LUBRICATING OIL COMPANY, 19 & 20, Water Lane, Tower St., London, E.C. Agents wanted.

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SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
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SULPHURIC ACID.
SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
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Correspondence invited.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

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THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, SUTTON, SURREY,
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

CORONATION, JUNE 22, 1911.

GAS Engineers should examine at once and send in to be put into thorough order all Gas Illumination Devices, as well as place orders for additional requirements with
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EDINBURGH, LONDON, GLASGOW, LEEDS.

JOHN W. LEITCH AND COMPANY,
MILNSBRIDGE CHEMICAL WORKS,
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The Manufacture of
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FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger The one Machine which Discharges and Charges at One Stroke.
See Advertisement, Jan. 24, p. II. of Centre.
ALDRIDGE AND RANKEN,
39, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

TAR WANTED.

THOMAS HORROCKS,
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

OUR DUTY—YOUR PLEASURE.

WHENEVER convenient to you, kindly ask us to furnish Particulars of
HIGH PRESSURE LIGHTING PLANT.
JAMES MILNE AND SON, LIMITED,
EDINBURGH, LONDON, GLASGOW, LEEDS.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Dec. 27, p. 892.

LUX'S GAS PURIFYING MASS.
See Advertisement on First White Page.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

COAL TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

FOR SALE.

SYPHON PUMPS of the very latest improved design.
Apply early
JAMES MILNE AND SON, LIMITED,
EDINBURGH, LONDON, GLASGOW, LEEDS.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

GAS OILS.

MEADE-KING, ROBINSON, & CO., Represent the Strongest) Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID — Specially pre- pared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

WANTED—Tar and Ammoniacal Liquor. Any Quantity.
GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone.: 480 HOLBORN. Telegrams: "Improvably, London."

SULPHATE of Ammonia Plant (Re- pairs, &c.). Leadburner and Chemical Plumber of Great Experience. Disengaged. Any Distance, with or without Plant. Has worked for Principal Firms, with 20 Years' References. Erecting, &c.
Address DAVIES, 118, Galloway Road, SHEPHERD'S BUSH.

A GENTLEMAN well-known in the gas world having Time and Office Room at Disposal, wishes to enter into Negotiations with Gas Companies requiring an AGENT or SECRETARY in London.
Address (in confidence) No. 5356, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for France, a French ENGINEER Experienced in the DISTILLATION OF TAR AND TAR PRODUCTS.
Address No. 5352, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CANVASSERS.

EXPERIENCED Men required by leading Gas-Stove Firm.

Apply, by letter, with full Information regarding Experience and Qualifications, to No. 5357, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a Representative with Connection in the South of England. Knowledge of Gas Apparatus and Gas Companies' Trade essential.

Apply, by letter, to No. 5349, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MAIDSTONE GAS COMPANY.

WANTED, a thoroughly Experienced HEAD CLERK and CASHIER, with previous Knowledge of Gas Accounts, Capable of taking Entire Charge of the Company's Books.

Salary £300 per Annum, rising by Annual Increments of £25 to £400 per Annum.

Applications, in own hand-writing, stating Age, which is not to exceed 40 Years, and Experience, with *copies* of Three recent Testimonials only, to be sent to the undersigned at the Maidstone Gas Company, on or before the 16th inst.

(Signed) GEORGE MARSHAM,
Chairman.

Maidstone, Feb. 1, 1911.

WANTED, at once, for the Abertillery Gas-Works, a WORKING FOREMAN. Must be a good Carbonizer and used to Regenerators, also Experienced in the Manufacture of Carburetted Water Gas and Sulphate of Ammonia. Good Mechanic preferred.

Make, 80 Millions per Annum.

Wages, £2 per Week, with House, Coal, and Gas.

Applications, with *copies* of recent Testimonials, to be addressed to George Jones, Esq., J.P., Chairman of the Council, Abertillery, and to be endorsed "Gas-Works Foreman."

LEONARD J. LANGFORD,
Engineer and Manager.

Gas-Works, Abertillery, Mon.

LLANELLY GASLIGHT COMPANY.

THE above Company require the Services of a competent Man as MANAGER and SECRETARY. The person appointed must fully understand the Manufacture, Purification, and Distribution of Gas, Regenerative Furnaces, and the Manufacture of Sulphate of Ammonia, and also Supervise the Company's Show-Rooms and Gas-Fittings Department.

Applicants to state Age, Experience, and also Salary required, with *copies* of not more than Three recent Testimonials.

Applications to be addressed to the Chairman of the Company, endorsed "Application for Manager," and to be sent in not later than the 3rd of March.

By order of the Directors,
THOMAS ACLAND,
Manager and Secretary.

Gas-Works, Llanelly.

PURIFIERS wanted, 8-feet, 10-feet, and 12-feet Square. We are open to Buy Sets of this Size, and have immediate Customer for 12-feet Squares.

Particulars and Price to FIRTH BLAKELEY, SONS, AND CO., LIMITED, Engineers, Thornhill, DEWSBURY.

FOR SALE—Two 12-inch and Six 8-inch HYDRAULIC MAIN VALVES, and Six 3-inch TAR VALVES, in good Condition.

Address F. C. HUMPHRYS, Gas-Works, ILKESTON.

FOR SALE—Complete Gas-Making PLANT, including New Gasholder and Steel Tank, 10,000 Cubic Feet capacity, ready for delivery, with Condensers, Scrubber, Purifiers, &c. Erected complete in England for £1200. Detailed Plan and Specification submitted.

TWO PURIFIERS, 12 ft. by 8 ft. by 5 ft. deep. Three Purifiers 5 ft. 6 in. square, complete with Four-Way Valves and Connections. Re-Erected cheap for immediate Sale.

GASHOLDERS, 16 ft., 24 ft., 26 ft., 30 ft., 42 ft., and 45 ft. diameter. Also 70,000 and 200,000 Cubic Feet capacity Gasholders. Cheap for immediate Sale. Re-Erected in either brick or new Steel Tanks. Full Particulars and Quotation submitted.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

THE Haworth Urban District Council are prepared to receive TENDERS for their Surplus TAR and LIQUOR for the Year ending March 31, 1911.

Tenders to be sent to me, endorsed "Tender for Tar and Liquor," not later than Feb. 28, 1911.

WILLIAM ROBERT SHAW,
Clerk.

Burlington Chambers,
North Street, Keighley.

BROADSTAIRS GAS COMPANY.

THE Directors of the Broadstairs Gas Company are prepared to receive TENDERS for Supplying, Delivering, and Erecting a SPIRAL GAS-HOLDER and STEEL TANK with FOUNDATIONS, or a SPIRAL GASHOLDER with BRICK TANK. The Site may be viewed by Appointment, and Particulars obtained from the undersigned.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders to be sent to the Chairman of the Gas Company, endorsed "Tender forGasholder," on or before the 21st of February, 1911.

F. HIGGINSON,
Engineer, Manager, and Secretary.

Gas Offices, Broadstairs,
Feb. 1, 1911.

BRITON FERRY URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the Supply and Construction of a TWO-LIFT GASHOLDER.

Plans, Specification, and Particulars may be obtained on Application to the Manager, Gas-Works, Briton Ferry.

Sealed Tenders, endorsed "Gasholder," to be delivered to the undersigned not later than noon on the 22nd of February, 1911.

TREVOR H. HUNTER,
Clerk.

Council Offices, Briton Ferry,
Feb. 6, 1911.

URBAN DISTRICT COUNCIL OF OLDBURY.

(GAS DEPARTMENT.)

THE Gas Committee are open to receive TENDERS for the Purchase of a STATION METER, 30,000 Cubic Feet per Hour, with 18 in. by 10 in. Inlet, Outlet, and Bye-Pass Connections. Being replaced by a larger size.

The Meter can be seen at work on Application to the undersigned.

The Gas Committee do not bind themselves to accept the highest or any Tender.

By order,
A. COOKE,
General Manager.

Gas-Works, Oldbury,
Feb. 4, 1911.

BOROUGH OF OSSETT.

THE Corporation of Ossett invite TENDERS for the Supply of MATERIALS, STORES, WORKMEN'S TOOLS, &c., required in the Highways, Gas, Lighting, Water, Sanitary, and Educational Departments for One Year from the 31st day of March next.

Specification and Form of Tender may be obtained at my Office on Application.

Sealed and endorsed Tenders to be delivered to me, the undersigned, at the Town Hall, Ossett, not later than Four o'clock on the 21st day of February, 1911.

The Corporation do not bind themselves to accept the lowest or any Tender.

T. W. WILSON,
Town Clerk.

Ossett, Feb. 7, 1911.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the Purchase of Surplus GAS TAR and OIL-GAS TAR, produced at their Gas Works, from the 1st of April next to the 31st of March, 1912, delivered into the Purchaser's Tank Waggons at the Gas-Works Siding.

Any further Information may be had on Application to the Manager of the Gas-Works.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office on or before Tuesday, the 21st of February, 1911.

The highest or any Tender not necessarily accepted.

By order,
L. HEWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

THE Corporation are prepared to receive TENDERS for the Supply of FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, OIL, LIME, IRONMONGERY, and SULPHURIC ACID, as may be required from the 1st of April next to the 31st of March, 1912.

Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 21st of February, 1911.

The lowest or any Tender not necessarily accepted.

By order,
L. HEWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

EXETER GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for such TAR as they may not desire to dispose of to persons other than Distillers, for Twelve Months from the 25th of March next, at per ton of 20 cwt. delivered into Contractor's Tanks at the Company's Works.

Sealed Tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Friday, the 3rd of March next; but the Directors do not bind themselves to accept the highest or any Tender.

By order,
WM. N. WESTLAKE,
Secretary and Manager.

Gaslight Offices, Exeter,
Feb. 9, 1911.

SOUTHAMPTON GASLIGHT AND COKE COMPANY.

ISSUE OF £6000 FIVE PER CENT. ORDINARY STOCK, AT £112 PER CENT., YIELDING £4 9s. 3d. PER CENT.

THE Directors of the above Company invite TENDERS for the above STOCK. The last date for the reception of Tenders will be Tuesday, the 28th day of February, at Twelve o'clock noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, may be had on Application to the Company's Offices, Ogle Road, Southampton, or from the Company's Bankers, LLOYDS BANK, LIMITED, SOUTHAMPTON, or Lombard Street, LONDON.

By order of the Directors,
J. R. H. JACOBS,
Secretary.

Jan. 23, 1911.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 500 £10 NEW ORDINARY FIVE PER CENT. MAXIMUM SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 28, at Two o'clock.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

SOUTH-WEST SUBURBAN WATER COMPANY.

NEW ISSUE OF 500 £10 FIVE PER CENT. PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 28, at Two o'clock.

Particulars of the AUCTIONEERS, as above.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Dining Hall of the Palatine Hotel, Borough Road, Sunderland, on Wednesday, Feb. 22, 1911, at Two o'clock in the Afternoon prompt,

MR. ATKINSON GIBSON, Auctioneer,

£10,000

(Nominal) of Additional ORDINARY CAPITAL STOCK (maximum Dividend 5 per cent.) authorized to be Created and Issued under the Powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1911, and be Registered in the name of the Purchaser *free of charge*.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 28th day of February, 1911.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 24th of February inst., at Half-past Two o'clock precisely, to Transact the usual Business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of Office, in compliance with the Company's Acts of Parliament.

The Dividends to be declared will be paid to the holders of Preference and Ordinary Stocks registered as Stock holders on the 9th of January, when the TRANSFER BOOKS of the Company were CLOSED.

By order of the Directors,
WILLIAM MANN,
Secretary.

Office, Brentford,
Feb. 6, 1911.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Holborn Restaurant, 218, High Holborn, London, W.C., on Tuesday, the 28th day of February, 1911, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last; to declare a Dividend; to elect Directors and an Auditor, in the place of those retiring by rotation; to determine the remuneration of the Directors; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 15th to the 28th of February, both inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 6 & 7, Queen Street,
Cheapside, London, Feb. 2, 1911.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Monday, the 27th day of February inst., at Half-past Two o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1910; to declare Dividends; to elect Two Directors and an Auditor; to determine the remuneration of the Directors; and for other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 14th to the 27th of February, both days inclusive.

ERNEST L. BURTON,
Secretary.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C.,
Feb. 13, 1911.